SERVICE INSTRUCTIONS

DBV Streamline

(Closed Circuit)

TM024-001

Solahart

Revision: A

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DBV270
270DBV

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Safety Warning

The purpose of this service manual is to provide sufficient information to allow a person with the skills as required by the Regulatory Authorities to carry out effective repairs to a Solahart Streamline Water Heater in the minimum of time.

Safety precautions or areas where extra care should be observed when conducting tests outlined in this service manual are indicated by print in ***bold italics*** and/or a warning symbol. Take care to observe the recommended procedure.

Certain diagnostic procedures outlined in these Service Instructions require "live" testing to be conducted. Personal Protective Clothing (PPE) shall be worn and an RCD shall be installed between the power point and 3-pin cord of the water heater to reduce the risk of electric shock.

If the supply cord is damaged, it must be replaced by the manufacturer or its service agent or a similarly qualified person in order to avoid a hazard.

Introduction

The information provided in these instructions is based on the water heater being installed in accordance with the Installation Instructions provided with each water heater.

Should you require further technical advice on a Solahart Streamline Water Heater, contact your nearest Rheem Service Department where genuine replacement parts are also available.

Water Heater Model Identification

The identification numbers are designed to convey detailed information about the water heater to which it is attached. The model number consists of 8 digits and letters.

Model Number

DBV	270	N5

Type & Cylinder Warranty OR Storage Capacity
DBV - Solar Drain back 5 Year Cylinder Warranty
270 - 270 Litres

Type & Cylinder Warranty OR Storage Capacity
DBV - Solar Drain back 5 Years Cylinder Warranty
270 - 270 Litres

Booster Capacity
00 - No boost
24 - 2.4kW Element
36 - 3.6kW Element
48 – 4.8kW Element
N5 - Natural Gas
P5 - Propane gas

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Specifications

Specification	All Models
Storage capacity	270 Litres
Temperature setting	60ºC
TPR valve setting	1000kPa
Solar circuit relief valve	200kPa
Max supply pressure	800kPa (680kPa with ECV)
Min supply pressure	200kPa
Water connections- tank	Inlet RP¾/20, Outlet RP¾ /20
Water connections- collector	Hot pipe ½" BSP, Cold pipe ½" BSP
Collector(s) type	J or KF
Supply voltage	220 – 250 Volts AC 50Hz
Solar circuit fluid	*4.5 Litres propylene glycol / 11.5 Litres water
Anodes	2 X 1153mm
Solar circuit pump	127.8 ohms
Solar circuit aux pump (optional)	127.8 ohms

* Approximate propylene glycol / water ratio. Refer to 'Commissioning Procedure' on page 57 for more information.

Power Consumption		
Solar controller	3 Watts	Constant load
Solar pump	165 Watts	Maximum load at solar heating cycle start up (for approximately two (2) minutes)
	50 Watts	Average load during the solar heating cycle
Heating unit (elec boost models only)	2.4kW, 3.6kW or 4.8kW	Consumption when booster heating unit is operating depending upon model
Gas Booster (gas boost models only)	146W	When anti frost device is activated

Electric Booster Specifications (electric boosted models only)			
Heating unit rating depending upon model	2.4kW	3.6kW	4.8kW
Amps	10	15	20
Element circuit resistance (ohms)	22 – 26	15 – 17	11 - 13
Booster capacity	125 litres		
Booster temperature setting	60ºC		

Gas Booster Specifications (gas boosted models only)	
Input	199mJ
Booster capacity	26L/min
Booster temperature setting	60ºC

For complete gas booster specifications refer to 26L Gas Booster Service Manual TM023-001.

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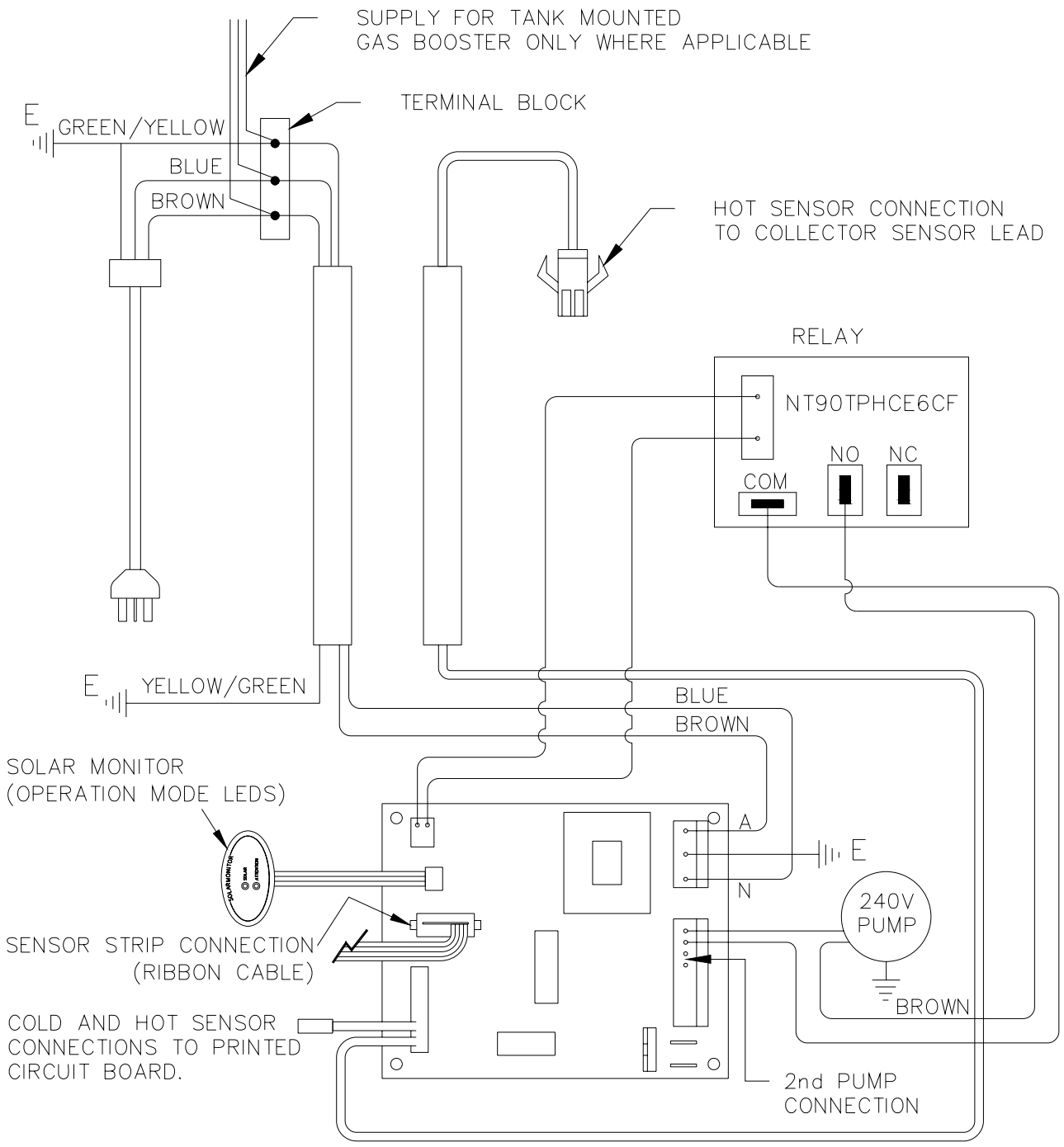
Wiring Diagram – Solar Preheat & Gas Boosted Models



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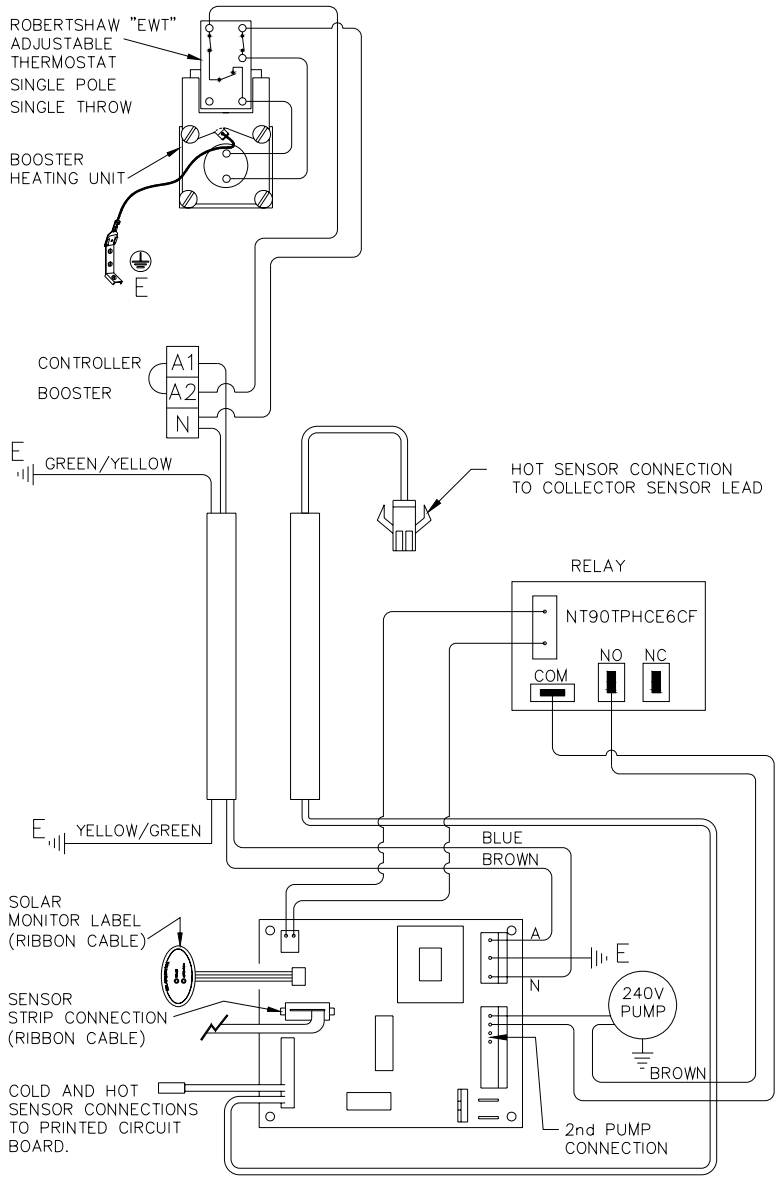
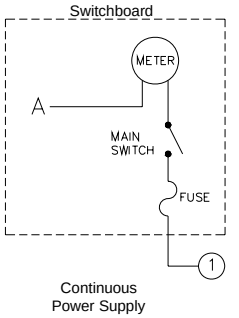
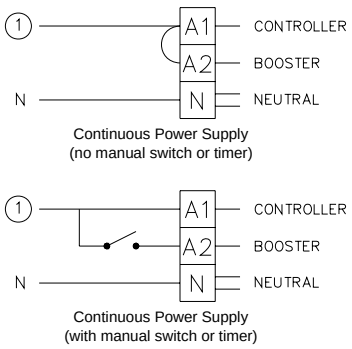
Wiring Diagram – Electric Boosted Models (Robertshaw EWT Thermostat)



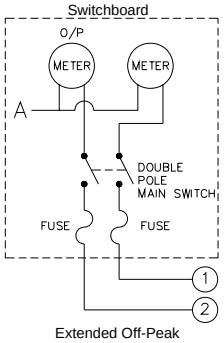
Wiring Diagrams - Electric Booster Circuit All Electric Boosted Models

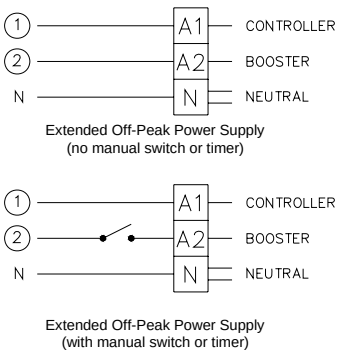
Continuous power supply to booster circuit - All Electric Boosted Models





Extended Off-Peak power supply to booster circuit - All Electric Boosted Models





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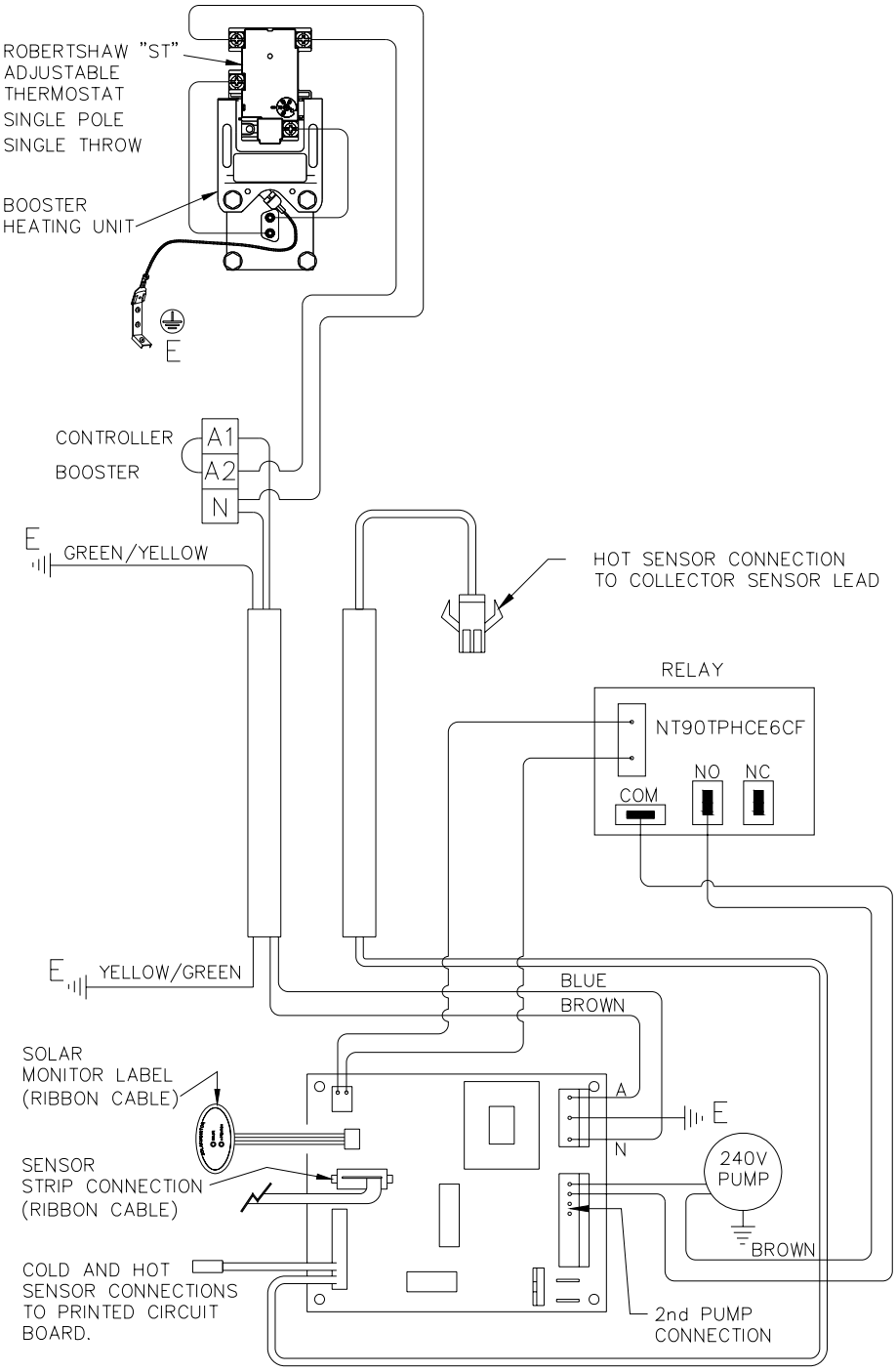
Wiring Diagram – Electric Boosted Models (Robertshaw ST Thermostat)



Note: Refer to page 6 for continuous or off-peak booster circuit wiring diagrams.

Operation

The Streamline closed circuit water heater is an indirect drain back solar Loline (collectors at roof level, cylinder at ground level) water heater. The fluid in the collector circuit is isolated from the potable water in the cylinder, hence the term ‘indirect’.

When there is insufficient solar gain or the cylinder is fully heated the pump is turned off allowing the heating fluid in the collectors and pipe work to ‘drain back’ to the central heat exchanger within the water heater.

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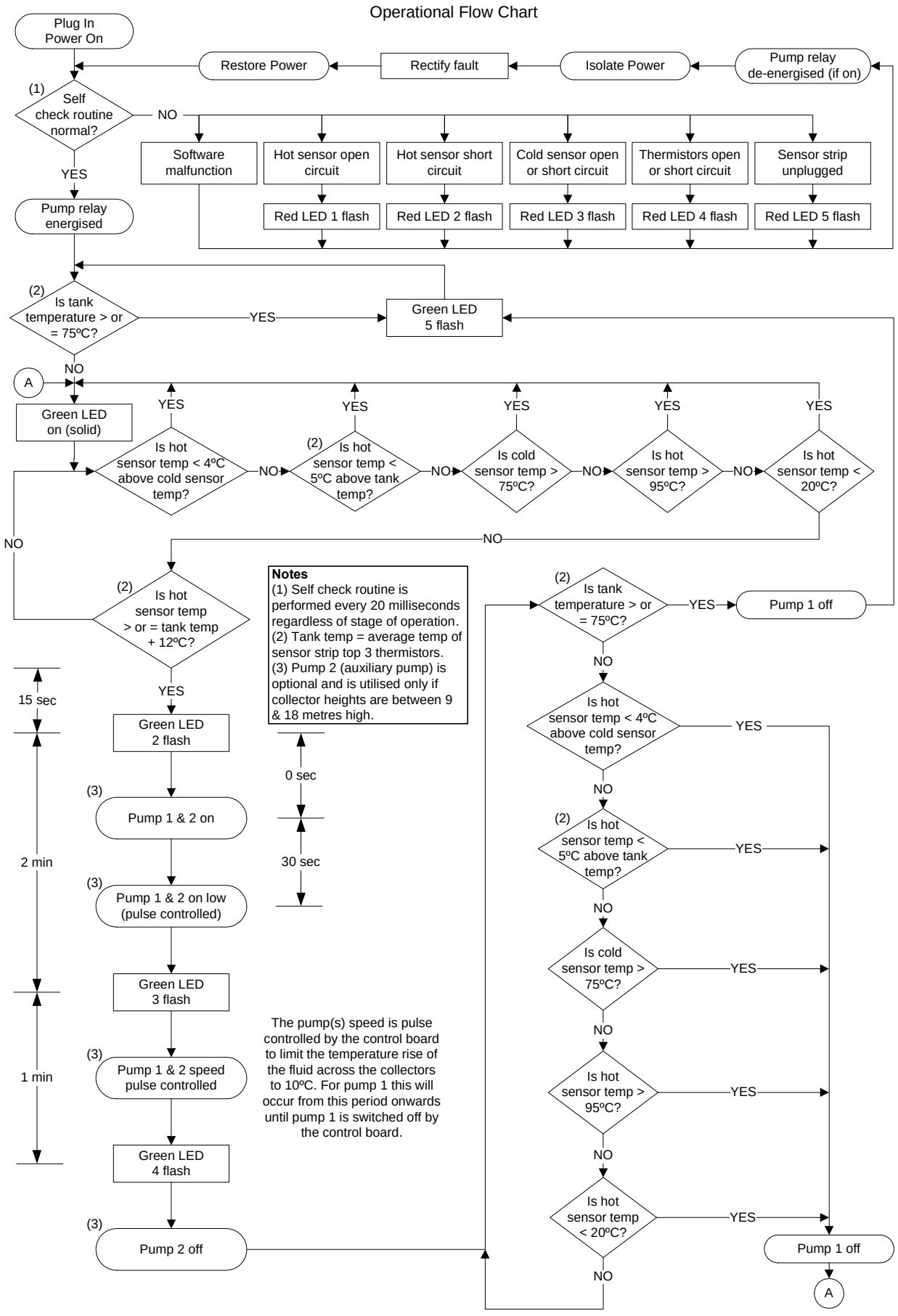
Operational Flow Chart


Operational Flow Chart
Plug In Power On
Restore Power
Rectify fault
Isolate Power
Pump relay de-energised (if on)
(1) Self check routine normal?
NO
YES
Software malfunction
Hot sensor open circuit
Hot sensor short circuit
Cold sensor open or short circuit
Thermistors open or short circuit
Sensor strip unplugged
Red LED 1 flash
Red LED 2 flash
Red LED 3 flash
Red LED 4 flash
Red LED 5 flash
Pump relay energised
(2) Is tank temperature > or = 75ºC?
YES
Green LED 5 flash
NO
A
Green LED on (solid)
YES
Is hot sensor temp < 4ºC above cold sensor temp?
NO
(2) Is hot sensor temp < 5ºC above tank temp?
NO
Is cold sensor temp > 75ºC?
NO
Is hot sensor temp > 95ºC?
NO
Is hot sensor temp < 20ºC?
NO
(2) Is hot sensor temp > or = tank temp + 12ºC?
YES
15 sec
2 min
1 min
Green LED 2 flash
(3) Pump 1 & 2 on
(3) Pump 1 & 2 on low (pulse controlled)
Green LED 3 flash
(3) Pump 1 & 2 speed pulse controlled
Green LED 4 flash
(3) Pump 2 off
0 sec
30 sec
Notes
(1) Self check routine is performed every 20 milliseconds regardless of stage of operation.
(2) Tank temp = average temp of sensor strip top 3 thermistors.
(3) Pump 2 (auxiliary pump) is optional and is utilised only if collector heights are between 9 & 18 metres high.
The pump(s) speed is pulse controlled by the control board to limit the temperature rise of the fluid across the collectors to 10ºC. For pump 1 this will occur from this period onwards until pump 1 is switched off by the control board.
(2) Is tank temperature > or = 75ºC?
YES
Pump 1 off
NO
Is hot sensor temp < 4ºC above cold sensor temp?
YES
NO
(2) Is hot sensor temp < 5ºC above tank temp?
YES
NO
Is cold sensor temp > 75ºC?
YES
NO
Is hot sensor temp > 95ºC?
YES
NO
Is hot sensor temp < 20ºC?
YES
NO
Pump 1 off
A

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Sequence of Operation - Solar

The following sequence of operation is common to all models and pertains to the solar circuit which is a 'closed circuit' containing a heating fluid consisting of propylene glycol and water. For information on electric and gas booster operation refer to page 10.

Refer to 'Sequence of Operation Component Diagram' on page 10 to view components shown in brackets e.g. **(1)**.

1. When power is supplied to the appliance the controller **(1)** performs a self check routine. If the software, sensor strip **(2)**, hot sensor **(3)** and cold sensor **(4)** are all functional the control board will energise the pump relay **(5)**. The pump relay **(5)** supplies power to the control boards internal pump switch. If any of the aforementioned components are faulty the pump relay will not be energised preventing pump **(6)** operation.
2. The cylinder **(7)** temperature is monitored by a sensor strip **(2)** containing 6 thermistors spaced at equal intervals along the strip. The sensor strip **(2)** is attached to the outer cylinder wall. The water temperature is derived by averaging the readings from the top 3 sensors.
3. As the vapour in the collector(s) **(8)** gains heat from solar radiation a sensor mounted in the collector (hot sensor) **(3)** senses the temperature increase.
4. The controller **(1)** will turn the pump **(6)** on when the temperature in the collector(s) is greater than or equal to 12°C above the average cylinder top temperature provided the cylinder top temperature is less than or equal to 75°C.
5. Heating fluid consisting of propylene glycol and water is pumped from the central heat exchanger **(9)** up to the collector(s) via the cold pipe **(10)**.
6. The fluid gains heat as it passes through the collectors **(8)** and returns to the top of the heat exchanger **(9)** where it passes through a distributor **(11)** which forces the fluid to run down the heat exchanger **(9)** walls in a film ('falling film'). The heating fluid gives off its heat through the heat exchanger **(9)** wall to the water in the cylinder **(7)**.
7. 15 seconds after the pump **(6)** commences operation the controller **(1)** limits the pump **(6)** speed to ensure the temperature rise of the fluid across the collector(s) **(8)** is limited to 10°C to prevent unnecessary cycling of the pump **(6)** and draining of the system.
8. The pump **(6)** is turned off when:
    - The Temperature rise across the collector(s) **(8)** (i.e. difference between the hot sensor **(3)** and cold sensor **(4)**) is less than 4°C, or:
    - The average cylinder **(7)** top temperature is greater than 75°C, or:
    - The temperature of the heating fluid leaving the heat exchanger **(9)** is greater than 75°C (detected by cold sensor **(4)**), or:
    - The temperature of the heating fluid leaving the collector(s) **(8)** is greater than 95°C (detected by hot sensor **(3)**), or:
    - The collector **(8)** temperature is less than 20°C (detected by hot sensor **(3)**), or:
    - The temperature of the heating fluid leaving the collector(s) **(8)** (detected by hot sensor **(3)**) is less than 5°C above the average cylinder **(7)** top temperature (detected by sensor strip **(2)**).

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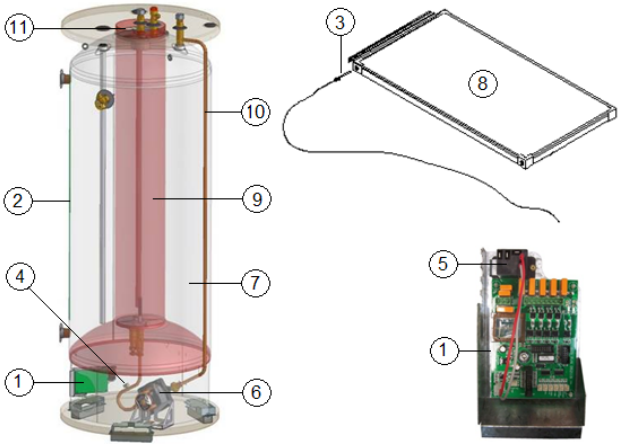
9. Once the pump **(6)** ceases operation the system commences to drain back. Fluid in the collectors **(8)** begins to fall back to the bottom of the heat exchanger **(9)** via the cold pipe **(10)** due to gravity; this creates suction on the fluid in the hot pipe **(12)** which is also drawn back through the collectors **(8)**.

   At the same time the heated vapour in the heat exchanger **(9)** is rising up through the distributor **(11)** and into the hot pipe **(12)** also forcing the fluid back through the collectors **(8)**. At the end of the process all the heating fluid is stored in the central heat exchanger **(9)** leaving the collectors **(8)** and connecting pipe work empty of heating fluid.

Sequence of Operation Component Diagram



1 Controller
2 Sensor Strip
3 Hot Sensor
4 Cold Sensor
5 Pump Relay
6 Pump
7 Cylinder
8 Collector(s)
9 Heat Exchanger
10 Cold Pipe
11 Distributer
12 Hot Pipe (not shown)

Electric Booster Operation – Electric Boosted Models

Electric boosted models are fitted with either a 2.4kW, 3.6kW or 4.8kW electric immersion type heating element depending upon model (refer to water heater model identification table on page 3). The element will heat the volume of water in the storage cylinder directly above the level of the element providing a 125 litre boost capacity.

Electric boosted models are fitted with a Robertshaw mechanical thermostat set at 60ºC. This thermostat controls the electric boost element only. The electric boost circuit operates simultaneously with the solar system and will heat the 125 litre boost volume to 60ºC regardless of whether the solar circuit is heating or not. Simultaneous operation can be prevented by the installation of a switch in the electric booster circuit.

The element & mechanical thermostat are located behind the top electrical access cover.

Gas Booster Operation – Gas Boosted Models

Gas boosted models have an integral in-line 26L Gas Booster mounted externally on the jacket of the heater. The in-line gas booster will only operate provided the flow is greater than 3 litres per minute and the inlet water temperature to the booster is less than or equal to 58ºC.

Gas boosted models have additional integrated plumbing connections which are located behind the front access cover (refer to ‘Gas Boosted Integrated Plumbing Arrangement’ on page 11).

Two hot water outlets are available on gas boosted models; a tempered water outlet (50ºC max) and an optional hot water outlet (65 - 75ºC). Gas boosted models do not require an external tempering valve to comply with ***AS3500.4 Clause 1.9.2(b)*** provided the tempered water plumbing is connected to the tempered water outlet. The tempered water outlet from this water heater will not deliver temperatures exceeding 50°C in accordance with ***AS 4032.2.*** For more information refer to ‘Tempering Valves’ on page 14.

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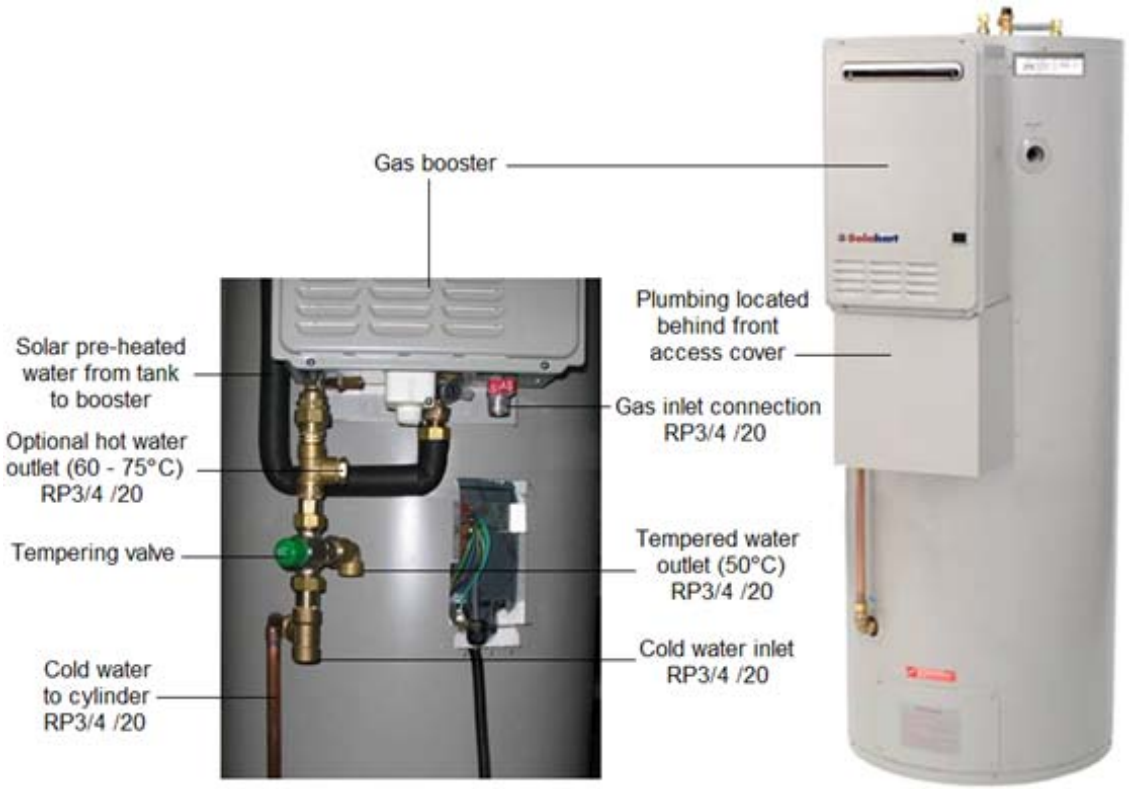
Gas Boosted Integrated Plumbing Arrangement


Gas booster
Solar pre-heated water from tank to booster
Optional hot water outlet (60 - 75°C) RP3/4 /20
Tempering valve
Cold water to cylinder RP3/4 /20
Plumbing located behind front access cover
Gas inlet connection RP3/4 /20
Tempered water outlet (50°C) RP3/4 /20
Cold water inlet RP3/4 /20

Solar Circuit

It is imperative that both the collector hot and cold pipes must fall continuously by at least 5º, or a 1 in 10 fall, to ensure proper drain back of heat exchange fluid into the storage cylinder.

Each collector should be angled 10-15mm from horizontal towards the hot outlet to ensure proper drain back of heat exchange fluid and to ensure that the hot sensor is located in fluid when the pump is on. Likewise it is essential that the collector connections are angled slightly downwards.

Failure to provide correct fall for the hot and/or cold pipes, collector(s) and collector connections will result in incorrect operation of this appliance.

The solar hot and solar cold pipes between the solar storage tank and the solar collectors <u>MUST BE</u> of copper and fully insulated with closed cell polymer insulation or similar (minimum thickness 13 mm). Thicker insulation may be required to comply with the requirements of AS/NZS 3500.4. The insulation must be weatherproof and UV resistant if exposed. All compression fittings must use brass or copper olives.

Plastic pipe <u>MUST NOT</u> be used, as it will not withstand the temperature of the closed circuit fluid generated by the solar collectors.

Solar pipe work which is oversized or is too long can result in the drain back system not operating effectively.

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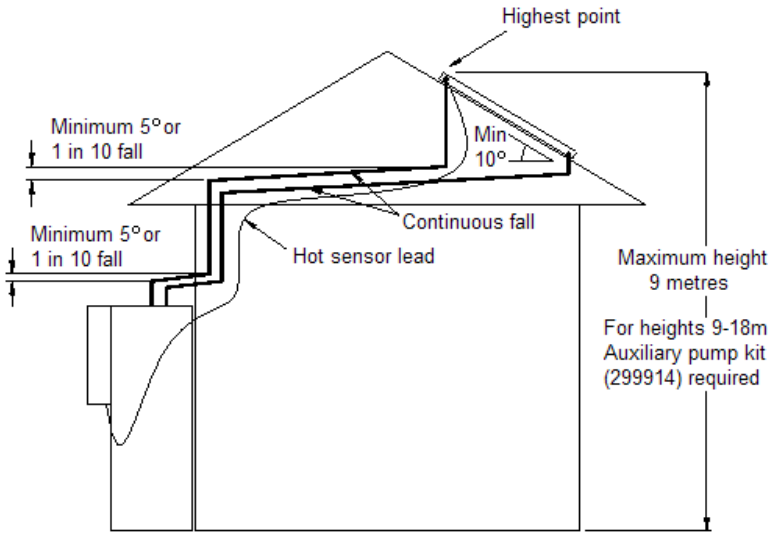
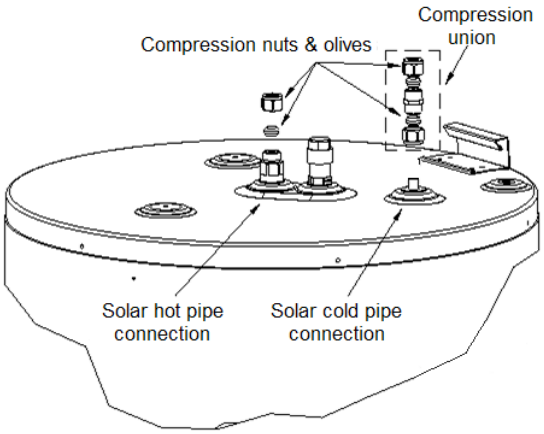
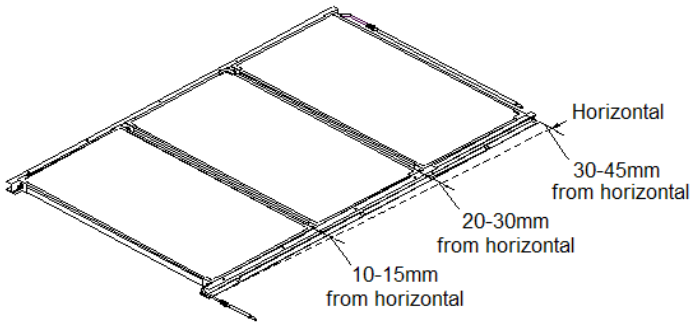
Solar Circuit Plumbing Diagrams - All Models

The solar collectors must be the highest point of the system. The maximum height of the solar installation, from the base of the solar storage tank to the top of the solar collectors, is 9 m. The pump supplied will not circulate closed circuit fluid through heights greater than 9 m and solar gain will not be achieved.

For heights greater than 9m, an auxiliary pump kit (PN 299914) must be installed. Refer to 'Auxiliary Pump - Solar Circuit' on page 13 for more information. The installation of an auxiliary pump will enable a maximum height of 18 m to be achieved.







Note: If the roof material is not even where the collectors are to be installed then it may be necessary to add 10mm for each collector in the array to these distances.

Maximum Total Pipe Length (solar cold + solar hot) & Number of 90° Bends				
Pipe Size	1 or 2 Collectors		3 Collectors	
	Pipe Length	90° Bends	Pipe Length	90° Bends
DN15	40 metres	20	30 metres	20

Notes:

- For each additional 90° bend, reduce the maximum total pipe length by 0.5 metres.
- For each additional metre of pipe length, reduce the number of 90° bends by two.
- One 90° elbow is equal to two 90° bends.

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Auxiliary Pump - Solar Circuit

The maximum height of the solar installation from the base of the solar storage tank to the top of the solar collectors is 9 m. The pump supplied with the solar storage tank will not circulate closed circuit fluid through heights greater than 9 m and solar gain will not be achieved.

For heights greater than 9 m, an auxiliary pump kit (kit PN 299914) must be installed above and within 1 m of the solar storage tank. The installation of an auxiliary pump will enable a maximum height of 18 m to be achieved. **Note:** The installation of an auxiliary pump does not allow for an increase in total pipe length of the system. The maximum pipe lengths shown in the table on page 12 must still be observed.

The arrows on the rear face of the pump indicate the direction of flow and should be pointing upwards when the pump is in the installed position.

The auxiliary pump speed setting must be set on 3. The solar control unit automatically controls and adjusts the speed of the pump to maximise solar contribution. Manual adjustment of the speed dial setting on a setting other than 3 may result in the system not operating correctly or efficiently. Note: If an auxiliary pump is utilised it will switch on with pump 1, run for 3 minutes to establish circulation then switch off. After this period pump 1 maintains circulation.

The two wire plug from the auxiliary pump connects to the terminals marked “PUMP 2” on the control board (refer to wiring diagrams on pages 5 & 6) and the earth wire spade connector from the auxiliary pump connects to a terminal on the earth connector strip located on the bracket adjacent to the control board. For information on installing an auxiliary pump refer to ‘Installation Instructions – Auxiliary Pump Kit Solar Drain Back Water Heater’.

Auxiliary Pump Kit Part Number 299914 Contents		
Part No	Description	Quantity
121994	Installation instructions auxiliary pump	1
299998	Pump Salmson HXL63-15P RU15/21 Union	1
108381	Bracket pump wall mount	1
108380	Cover pump wall mount	1
080031	Screw phillips pan head no 8 x 13	4
088063	Union fitting assembly ½” x ½” male (includes union ½” x ½” male, copper olive, compression nut)	2
080138	Cable tie black 200 mm long	10
N/A	Cable tie mount adhesive backed 4 way	4

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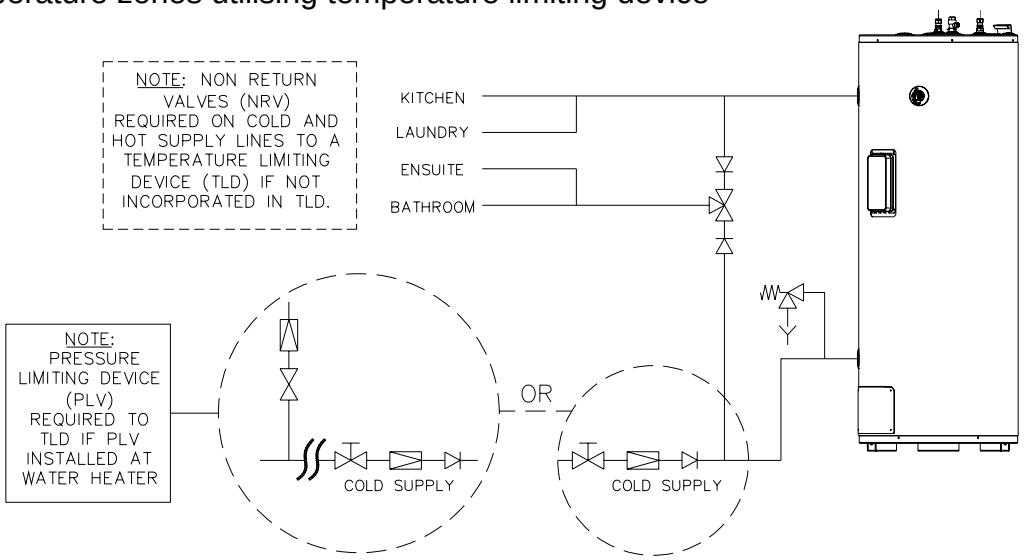
Potable Water Plumbing Diagrams

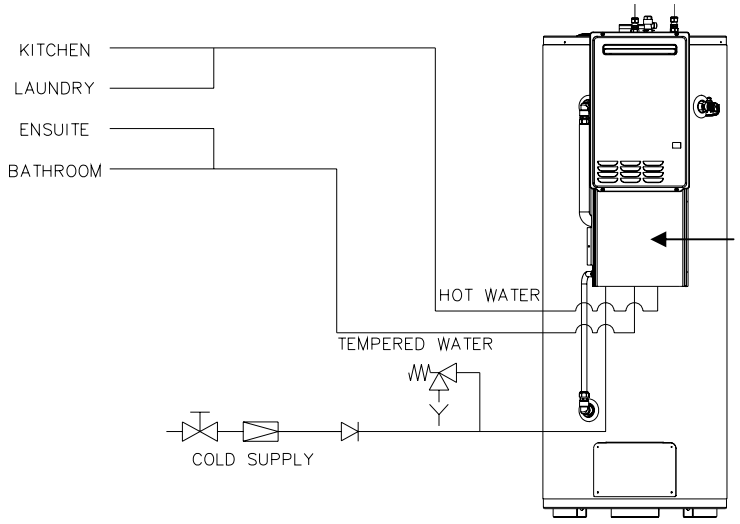
Plumbing Diagram – Solar Preheat & Electric Boosted Models

Two temperature zones utilising temperature limiting device


NOTE: NON RETURN VALVES (NRV) REQUIRED ON COLD AND HOT SUPPLY LINES TO A TEMPERATURE LIMITING DEVICE (TLD) IF NOT INCORPORATED IN TLD.
KITCHEN
LAUNDRY
ENSUITE
BATHROOM
NOTE: PRESSURE LIMITING DEVICE (PLV) REQUIRED TO TLD IF PLV INSTALLED AT WATER HEATER
OR
COLD SUPPLY
COLD SUPPLY

Plumbing Diagram – Gas Boosted Models

Two temperature zones utilising temperature limiting device integrated with water heater



Gas boosted integrated plumbing behind front access cover contains a tempering valve and provides both a hot (75ºC) and tempered (50ºC) water outlet.

Note: Refer to page 11 for gas boosted integrated plumbing arrangement.

Tempering Valves

Solar preheat and electric boosted models require the installation of a tempering valve to comply with the requirements of ***AS3500.4*** (refer to plumbing diagram on top of page).

Gas boosted models do not require an external tempering valve to comply with ***AS3500.4 Clause 1.9.2(b)*** provided the tempered water plumbing is connected to the tempered water outlet. The tempered water outlet from this water heater will not deliver temperatures exceeding 50ºC in accordance with ***AS 4032.2.***

To enable delivery of hot water at temperatures above 50ºC a separate untempered line must be provided that supplies hot water exclusively to kitchen and laundry areas (refer to plumbing diagrams above). Note: Gas boosted models have an integrated tempering valve and provide both a tempered and untempered hot water outlet.

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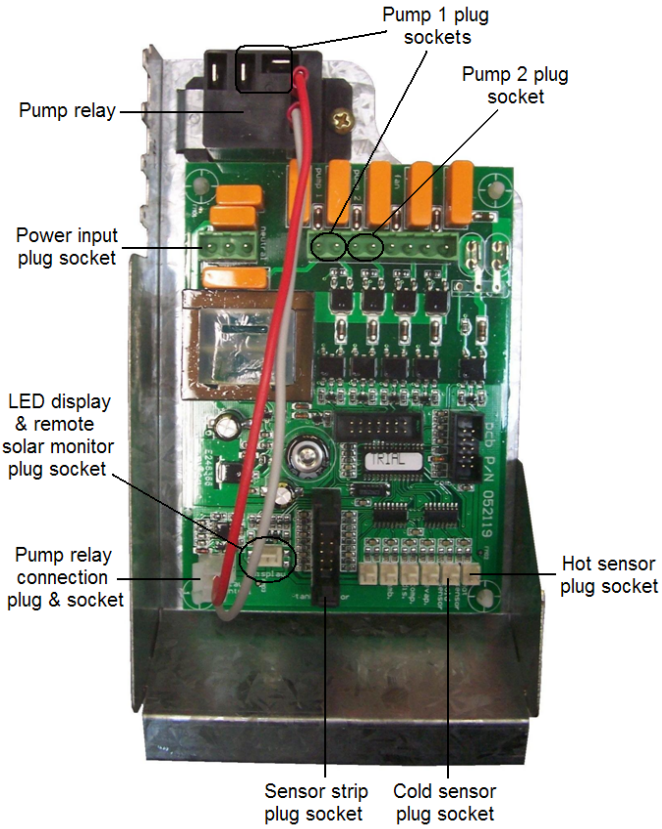
Electronic Controller

The control board or electronic controller is used to control the pump by monitoring the water temperatures and heat transfer temperatures at various locations within the system.

By monitoring the temperature of the heat transfer fluid returning to the solar collectors (cold sensor) and the temperature of the fluid at the outlet of the collectors (hot sensor), the controller adjusts the pump speed to regulate the temperature rise through the collectors to 10ºC.

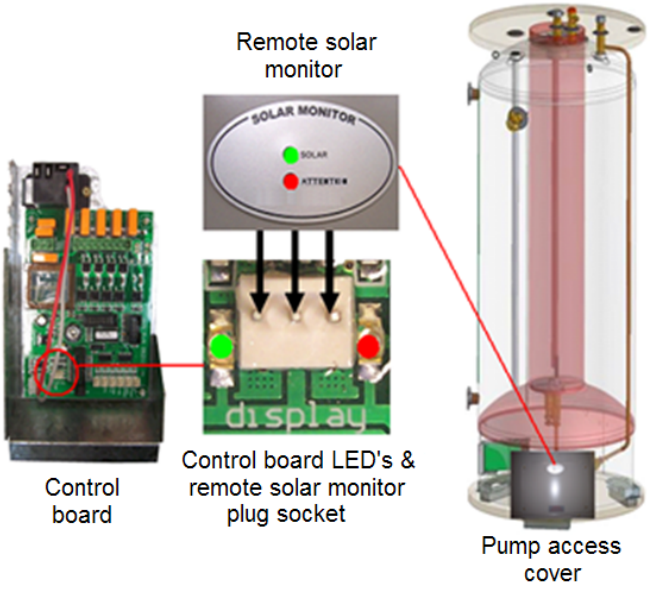
The controller also monitors the water temperatures within the storage cylinder and regulates when solar heating should occur.


Pump 1 plug sockets
Pump 2 plug socket
Pump relay
Power input plug socket
LED display & remote solar monitor plug socket
Pump relay connection plug & socket
Hot sensor plug socket
Sensor strip plug socket
Cold sensor plug socket

Solar Monitor

A remote solar monitor is located on the front of the cylinder pump access cover. The remote solar monitor plugs into the control board display socket and has two LED's which indicate the operational mode or fault status of the system. The green LED (marked solar) is used to indicate the present operating mode of the controller whilst the red LED (marked attention) is used to indicate a fault condition.

Solar preheat and gas boosted models manufactured before 01/11/2006 do not have a remote solar monitor however the control board has an inbuilt solar monitor (green and red LED mounted on the control board) which can be viewed by removing the pump access cover.



It should be noted that on early versions the solar monitor connection plug is not polaritive sensitive and may be inserted into the control board plug socket either way. If unusual fault codes are occurring, such as a solid red LED when in standby mode (instead of green), or a flashing red LED whilst the pump is operating (instead of flashing green), the solar monitor plug polarity should be tested by performing the following procedure:

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Solar Monitor Plug Polarity Test

1. Release water from the T&PR valve until the water temp in the cylinder is < 75ºC.
2. Switch off power for 5 seconds and then restore power.
3. If the LED flashes green (any combination) or is solid red **within the first 15 seconds** from restoring power, the solar monitor plug is inserted the wrong way around.

Solar Monitor LED Indication

Each flash lasts for 0.5 seconds and each series of flashes is separated by a two second interval.

Green LED - Operational Status		Red LED - Fault Condition	
Flash Sequence	Indicates	Flash Sequence	Indicates
Solid green (on)	Standby mode	1 Flash	Hot sensor open circuit
2 Flash	Flooding solar circuit period	2 Flash	Hot sensor short circuit
3 Flash	Pump(s) flow control period	3 Flash	Cold sensor open / short circuit
4 Flash	*Pump flow established.	4 Flash	Open or short circuit of any top 3 thermistor on sensor strip
5 Flash	Cylinder at maximum temp.	5 Flash	Sensor strip unplugged

* When pump flow is established auxiliary pump 2 is turned off by the control board (if fitted) whilst pump 1 continues to operate.

Components and Their Function

Temperature and Pressure Relief Valve (T&PR)

A valve designed to provide automatic relief by discharging water in case of excessive temperature and/or pressure.

Never fit a T&PR Valve with a pressure rating greater than that indicated on the product-rating label.

Storage Cylinder

A fully welded steel cylinder incorporating a convex (plus) top, concave (minus) bottom and central tube (heat exchanger). The cylinder is lined with vitreous enamel to provide protection against corrosion throughout the life of the water heater.

Outlet Delivery Tube (Dip Tube)

A plastic tube installed in the hot water outlet of the water heater cylinder to conduct water from the highest point to the outlet connection. It also acts as a fitting liner.

Fitting Liner

A plastic tube installed in the cold-water inlet of the water heater to provide protection against corrosion throughout the life of the water heater.

Cold Pipe (Solar Return)

The pipe connecting the solar collectors to the storage water heater through which the cooler solar transfer fluid returns from the storage cylinder to the collectors.

Hot Pipe (Solar Flow)

The pipe connecting the solar collectors to the storage cylinder through which the solar heated solar transfer fluid flows back to the storage cylinder from the collectors.

Electronic Controller

An electronic control unit that interprets low voltage signals indicating water temperature from the hot and cold sensors to switch on and off the 240 volt circulating pump circuit. The unit is factory set and cannot be adjusted or mega-ohm tested. Refer to page 15 for more information.

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Pump
An electro-mechanical device that pumps solar transfer fluid through the collectors by centrifugal force. The control board varies the flow rate of the pump by pulsing the electrical supply to the pump motor. The flow rate is proportionate to the pulse rate. e.g. higher pulse rate = higher flow rate.

Pump Relay
The pump is controlled and switched by the control board however the pump power supply may be interrupted by the relay in the event of a software malfunction or over temperature condition. If a fault develops in the controller software or the cylinder reaches over temperature (95ºC) the controller will de-energise the pump relay. This will open circuit the pump wiring and prevent the pump from operating.

Hot Sensor
A thermistor type sensor utilised to sense the air/fluid temperature in the collector(s). The hot sensor is fitted into the unused connection at the top of the collector array on the opposite side to the hot pipe connection. The hot sensor plugs into and is monitored by the control board.

Cold Sensor
A thermistor type sensor utilised to sense the fluid temperature leaving the heat exchanger. The cold sensor is fitted into a pocket in the pipe work between the heat exchanger outlet and the pump. The cold sensor plugs into and is monitored by the control board.

Anode (Sacrificial)
A metal alloy electrode (magnesium) installed in the water heater cylinder that by galvanic action protects the cylinder from corrosion. All Streamline models are fitted with two anodes both of which are located in the potable water section of the storage cylinder.

Thermistor Strip (Sensor Strip)
A thermistor type sensor strip mounted down the external face of the storage cylinder between the cylinder jacket and storage cylinder. The sensor strip has 6 equally spaced thermistors however the water temperature of the cylinder is derived by averaging the readings from the top 3 sensors only. It should be noted that the lower three sensors are not used. The thermistor strip plugs into and is monitored by the control board.

Heat exchanger
Heat exchange from the solar heated transfer fluid to the water in the storage tank is by means of a ‘falling film’ on the inside wall of the heat exchanger. The fluid entering the heat exchanger top is diverted through an internal four channel distributor which creates the falling film.

Mechanical Thermostat – Electric Boosted Models Only
A device responsive to temperature which controls the supply of electrical energy to the element to maintain the heater water at the required temperature. The mechanical thermostat controls the electric boost element only.

Over Temperature Energy Cut-out (E.C.O.) – Electric Boosted Models Only
A temperature-sensing device integral to the mechanical thermostat that automatically cuts off the supply of electrical energy to prevent excessive water temperature occurring. This device will not reset automatically but may be manually reset once temperatures have fallen to a safe level.

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Heating Unit (Element) – Electric Boosted Models Only
A tubular device containing an electric resistance element that converts electrical energy to heat. Standard element ratings are 2.4kW, 3.6kW and 4.8kW.

Integral Gas Booster – Gas Boosted Models Only
A 26L litre Gas Booster mounted externally on the heater jacket which will boost the solar preheated water to 60ºC if required. Refer to page 10 for more information.

Product Changes

Solar Monitor Changes – All Models

A remote solar monitor was introduced to solar preheat and gas boosted models on the 01/11/2006. Solar preheat and gas boosted models manufactured before 01/11/2006 do not have a remote solar monitor however the control board has an inbuilt solar monitor (green and red LED mounted on the control board) which can be viewed by removing the pump access cover.

All electric boosted models have a remote solar monitor regardless of date of manufacture. Refer to page 15 for more information on solar monitors. For solar monitor LED indication modes and their meaning refer to the table on page 16.

Gas Booster Integral Plumbing Changes – Gas Boosted Models Only

The gas booster insulated copper hot and cold pipes (items 32a & 33a) have been replaced with insulated flexible hoses (items 32b & 33b) effective 17/09/2007. Note: Refer to replacement parts list on page 53 for ‘a’ and ‘b’ items and exploded view 1 on page 52.

To replace an existing copper hot pipe (item 32a) with a flexible hose (item 32b):

- Obtain 1 x 088137 Flexible hose insulated 440 x ¾” (item 32b).
- Discard the nut and olive on the elbow at the heater hot outlet (item 31b) and screw the flexible hose directly to the elbow.
- Remove union from Integrity inlet (item 41a) and replace with elbow part number 088117 (item 41b).
- Connect remaining end of flexible hose to elbow (item 41b).

To replace an existing cold pipe (item 33a) with a flexible hose (item 33b):

- Obtain 1 x 088138 Flexible hose insulated 450 x ¾” (item 33b).
- Discard the nut and olive on the elbow at the heater cold inlet (item 31b) and screw the flexible hose (item 33b) directly to the elbow.
- Remove union from tee (item 43a) and replace with elbow part number 088117 (item 43b).
- Connect remaining end of flexible hose to elbow (item 43b).

Minor Plumbing Changes – All Models

Effective 19/09/06 –Solar Hot Connection

- Item 12 - 088092 brass extension fitting replaced by 088118 brass extension fitting
- Item 2 – 088063 Union ½”C x ½”M replaced by 088119 compression nut
- Item 11 – 080163 washer replaced by 088027 compression olive

Note: This means the solar hot connection is different although the installing plumber still makes to two ½” copper connections.

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Effective 10/08/07 – Solar Cold Connection

- The cold pipe which is foamed into the heater had the large brass fitting removed so that just the pipe protrudes.
- Item 2 – Union ½"C x ½"M is replaced by 088065 compression union ½"C x ½"C which is now item 2a.
- Item 10 - 087035 Rubber disc is replaced by 221754 Kelvindale plug which is now item 10a.

Note: This means the solar cold connection is different although the installing plumber still makes to two ½" copper connections.

Thermostat Changes – Electric Boosted Models Only

The Robertshaw ST thermostat was introduced to electric boosted models on 14/08/2007 and replaces the Robertshaw EWT thermostat used previously.

It should be noted that although ST series thermostat is a direct replacement for the EWT series thermostat the terminal connections and wiring arrangement is different, therefore;

Whenever an EWT series thermostat is replaced with a ST series thermostat as a spare part, each appliance will require rewiring at the thermostat. Refer to wiring diagrams on pages 6 & 7 for wiring arrangements for EWT and ST series thermostats.

Preventative Maintenance

It is suggested for peak performance that the water heater be serviced annually. Servicing is to be performed by qualified persons.

1. Check for discharge from the T&PR valve. Whilst the electric booster (if fitted) is off, and during periods of low solar contribution there should be no discharge of water. When the electric booster (if fitted) is operating or during periods of high solar contribution, a small discharge of water may be evident. Operate the valve-easing lever to ensure the valve opens and resets properly. Always open and close the valve gently. The T&PR valve should be replaced at 5 yearly intervals.
2. Check for leaks at the collector connectors, hot and cold pipes and all tank fittings.
3. Check the collector glass is not cracked and the absorber plate finish is not deteriorating.
4. Confirm all supports and anchors retaining the collector(s) to the roof are present, firmly fixed and in good condition.
5. Clean the collector glass. Do not stand on the collectors while cleaning.
6. Check for signs of plant or tree growth that may be shading the collectors. Advise customer to have pruned if possible.
7. Check for signs of excessive corrosion on the water heater jacket, collector panels and roof stand if fitted.
8. ***Isolate power*** and check all electrical connections for signs of overheating due to poor connection.
9. **Electric Boosted Models Only**
   Conduct an electrical insulation test on the electric booster circuit only (refer to page 42). Note: Do not Megger test the electronic controller.

   Gas Boosted Models Only - Refer to TM023-001 26L Gas Booster Service Instructions for preventative maintenance information on the 26L Gas Booster.

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Common Faults

When a complaint is lodged about the performance of a hot water system there are a number of causes that should be checked and eliminated. In an attempt to pinpoint the most likely cause it is important to discuss with the customer their reasons for the complaint, the duration of the problem, any change in circumstances or usage and recent weather conditions. This information in conjunction with the following listed common complaints will assist you in locating the most likely cause. All procedures assume there is water flowing through the water heater.

Excessive hot water usage

The complaints of insufficient hot water and no hot water can on many occasions be attributed to hot water usage exceeding the capacity of the water heater to provide hot water.

When first attending a call of this nature it is essential to establish the probable hot water usage by querying the usage habits of the household and then comparing this with the potential delivery of the model water heater installed. It can then be established if the usage is within or outside the capacity of the model. The areas to look at for excessive usage are:

1. Automatic washing machines.
2. Showers exceeding 11 litres/minute for mixed water and 5 minutes in duration.
3. Two or more showers operating at the same time.
4. Change of occupancy or an increase in the number of persons.
5. High water pressure area (Excessive T&PR discharge).
6. Plumbing leaks.

Discoloured water

1. This may be the result of discoloured water entering from the cold water mains. Check if the cold water is also discoloured.
2. Brown coloured water will generally indicate that the anode has been depleted or the water heater is near the end of its useful life.
3. Milky coloured water is generally air in suspension and will disperse of its own accord. In very hard water areas where anode gassing occurs, milky water may be evident. The use of a blue anode should overcome this problem.

Water hammer

A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem i.e. cold-water stopcock, non-return valve, T&PR valve or relief valve.

Most water hammer problems are associated with hot and/or cold plumbing or appliances i.e. solenoid valves, ballcocks, loose pipes, sharp angles in pipe work, faulty or worn valve parts or neighbouring equipment.

High water pressure areas will have more complaints of this nature and the use of a pressure-limiting valve (PLV) to reduce the household cold-water pressure will usually solve most problems.

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Roof leaking

This complaint is usually made during or after wet weather and normally soon after commissioning a new water heater. The movement of persons on the roof during installation can crack roofing material if the load is borne on specific points or the roof material is brittle.

Replacement of damaged roof materials is essential. Use of a woven plastic roof sheet below the collectors will make water penetration more difficult in the future. It should also be established if water is penetrating around the pipe or sensor joints through the roof.

Moisture under the collector glass

Small amounts of condensate on the underside of the collector glass are not a sign of collector failure. The condensation is formed from humid air condensing when the collector cools down. Because of high temperatures within the collector, ambient air is transferred in and out of the collector through drain holes. Note: The collector is not hermetically sealed.

Hot water plumbing leaks

If hot water has not been used for a period of time, feeling the temperature of the hot water line may give an indication of water flow if the pipe is warm. The method of checking for plumbing leaks is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap to ensure the flow of water stops. This will confirm the stopcock is operating correctly.
3. Turn off the hot tap.
4. Turn on the stopcock to make up the water pressure in the cylinder, and then turn the stopcock off again.
5. Wait approximately 5 minutes then do either of the following:
   a. With your ear close to the stopcock turn it on slightly and listen for any water passing. If there are no leaks, water should not pass.
   b. Open a hot tap while listening for any pressure release. If there is a pressure release there will be no leaks in the plumbing system.

Mixing or crossed connections

If an automatic dishwasher, washing machine, flick mixer tap, tempering valve or thermostatic mixing valve is installed there is always the possibility that the cold water could mix with the hot water through a faulty or incorrectly installed valve. This is referred to as a cross connection. The complaints of insufficient hot water, water too cold or excessive discharge from the T&PR valve may be attributed to a cross connection. The method of checking for a cross connection is:

1. Turn off the stopcock on the cold water supply to the water heater.
2. Open a hot tap. If water flow is persistent and cold a cross connection exists.

Fault Finding

Test Equipment

A list of test equipment which will assist in conducting diagnostic procedures is provided below. This equipment is available from Rheem Service Spare Parts Department.

Fine probe adapter kit	WH0020082
Probe to alligator clip kit	WH0020084

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Testing the Sensor Strip

Unplug the sensor strip plug from the control board and using a multimeter on the kilo-ohms scale, measure between the pins of the sensor strip plug*. There are six individual tests to be performed as there are six individual sensors contained along the length of the sensor strip (sensors S0 – S5). As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the 'Sensor Strip Temperature/Resistance Table' shown below. For this reason it is best to empty the tank of hot water and then measure the cold water temperature at the T&PR so a known temperature datum can then be applied to all sensors which should then in turn all have a similar resistance value when tested.

Sensor Test Points

S0 – Between Pins 1 and 9

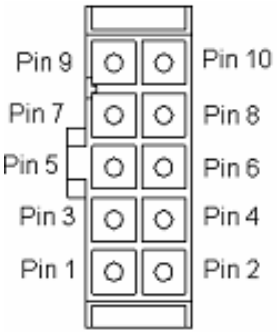
S1 – Between Pins 2 and 9

S2 – Between Pins 4 and 9

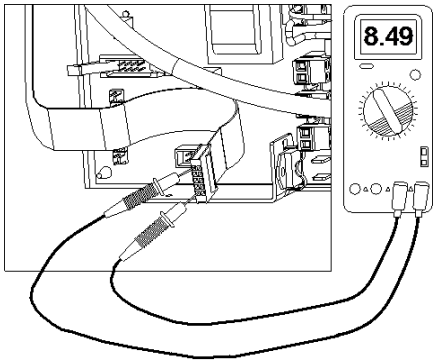
S3 – Between Pins 6 and 9

S4 – Between Pins 3 and 8

S5 – Between Pins 3 and 10



Sensor strip plug pin configuration



Testing the sensor strip

*Note: The sensor strip plug test points are quite small, Fine Probe Adapters (part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used however ensure good contact is made when testing.

Sensor Strip Temperature / Resistance Table

T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)	T (°C)	R (kΩ)
-10	37.45	10	15.45	30	7.037	50	3.485	70	1.853
-9	35.73	11	14.82	31	6.782	51	3.371	71	1.799
-8	34.11	12	14.22	32	6.537	52	3.262	72	1.743
-7	32.56	13	13.65	33	6.302	53	3.157	73	1.695
-6	31.10	14	13.10	34	6.076	54	3.055	74	1.646
-5	29.71	15	12.58	35	5.86	55	2.957	75	1.589
-4	28.39	16	12.09	36	5.653	56	2.863	76	1.552
-3	27.13	17	11.61	37	5.454	57	2.773	77	1.508
-2	25.94	18	11.16	38	5.264	58	2.686	78	1.465
-1	24.81	19	10.72	39	5.081	59	2.602	79	1.424
0	23.73	20	10.31	40	4.905	60	2.521	80	1.384
1	22.71	21	9.913	41	4.736	61	2.442	81	1.345
2	21.73	22	9.535	42	4.574	62	2.367	82	1.307
3	20.81	23	9.173	43	4.418	63	2.295	83	1.271
4	19.92	24	8.826	44	4.269	64	2.225	84	1.236
5	19.09	25	8.495	45	4.125	65	2.157	85	1.202
6	18.29	26	8.177	46	3.987	66	2.092	86	1.169
7	17.52	27	7.873	47	3.854	67	2.029	87	1.137
8	16.80	28	7.583	48	3.726	68	1.968	88	1.107
9	16.11	29	7.304	49	3.603	69	1.91	89	1.077

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Testing the Hot and Cold Sensors

Unplug the relevant sensor from the control board and remove the sensor from its location so its temperature will be the same as the ambient air temperature. Using a multimeter on the kilo-ohms scale, measure between the two pins of the sensor plug*. As the resistance of each sensor will change according to its temperature, the resistance measurements for each sensor will need to be checked against the 'Hot & Cold Temperature/Resistance Table' shown below and the value then compared to the ambient air temperature.

*Note: The sensor strip plug socket test points are quite small, Fine Probe Adapters (part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used however ensure good contact is made when testing.

Hot & Cold Sensor Temperature / Resistance Table

The table below sets out the resistance for the hot or cold sensor for a given water or air temperature.

Temperature Degrees C	Resistance (Hot or Cold Sensor) Kilo-ohms
0	23.73
10	15.45
20	10.31
30	7.037
40	4.905
50	3.485
60	2.521
70	1.853
80	1.384

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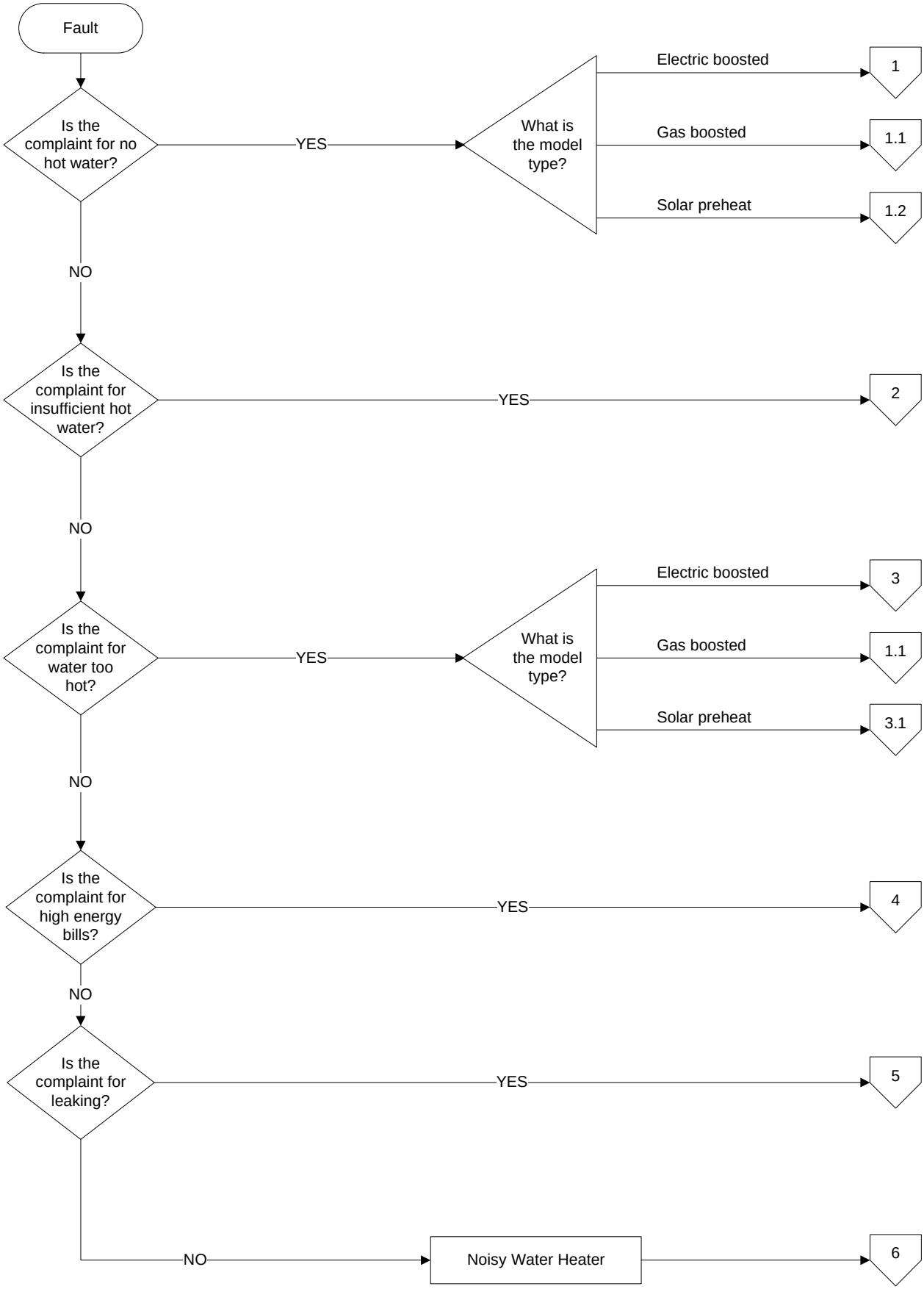
Fault Diagnosis Sequence (General Fault Finding Chart)

General Fault Finding Chart



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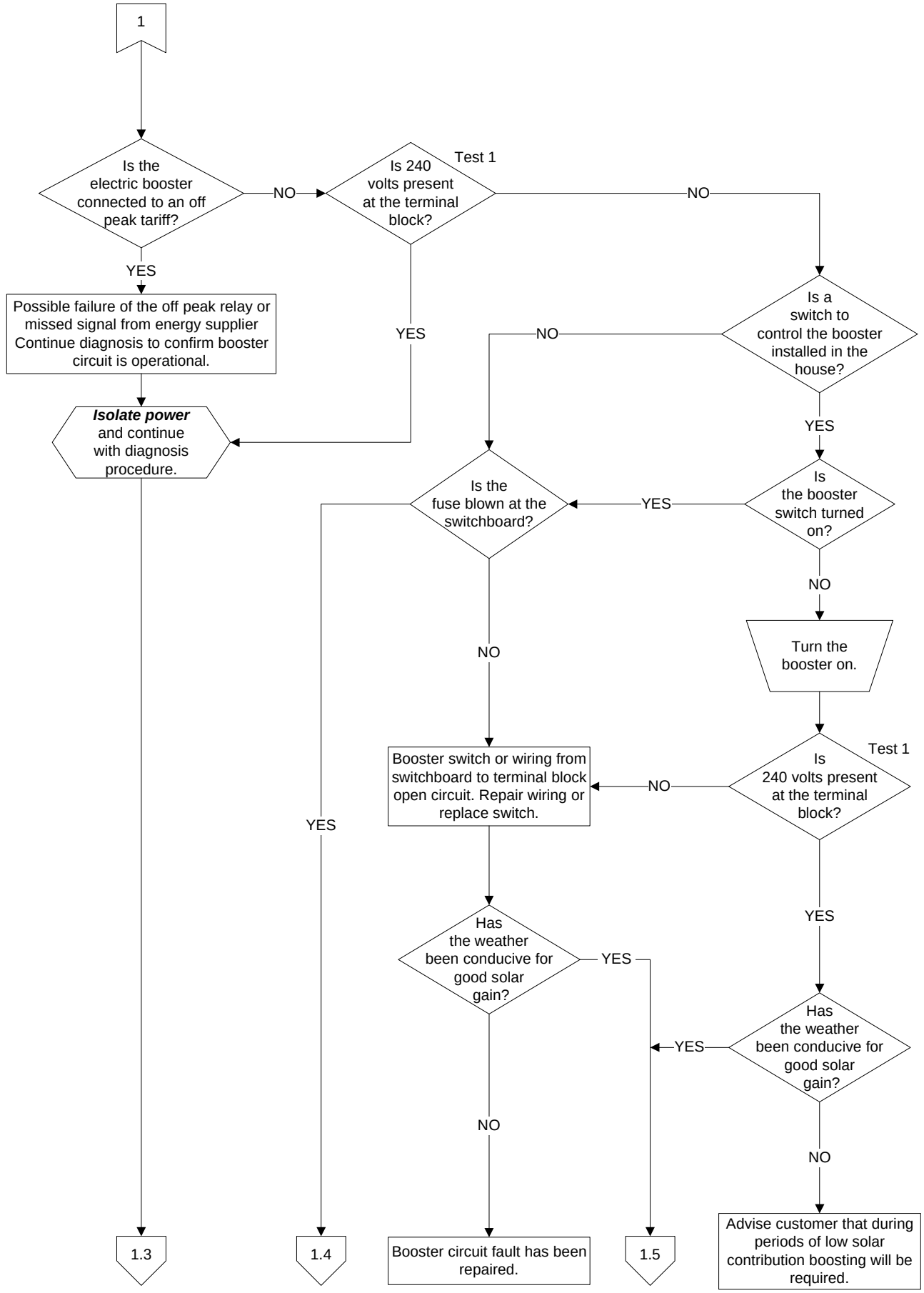
Fault Finding Chart 1


1
Is the electric booster connected to an off peak tariff?
NO
Is 240 volts present at the terminal block?
Test 1
NO
YES
Possible failure of the off peak relay or missed signal from energy supplier Continue diagnosis to confirm booster circuit is operational.
YES
Is a switch to control the booster installed in the house?
NO
YES
Isolate power and continue with diagnosis procedure.
Is the fuse blown at the switchboard?
YES
Is the booster switch turned on?
NO
Turn the booster on.
NO
YES
Booster switch or wiring from switchboard to terminal block open circuit. Repair wiring or replace switch.
NO
Is 240 volts present at the terminal block?
Test 1
YES
Has the weather been conducive for good solar gain?
YES
NO
Has the weather been conducive for good solar gain?
YES
NO
1.3
1.4
Booster circuit fault has been repaired.
1.5
Advise customer that during periods of low solar contribution boosting will be required.

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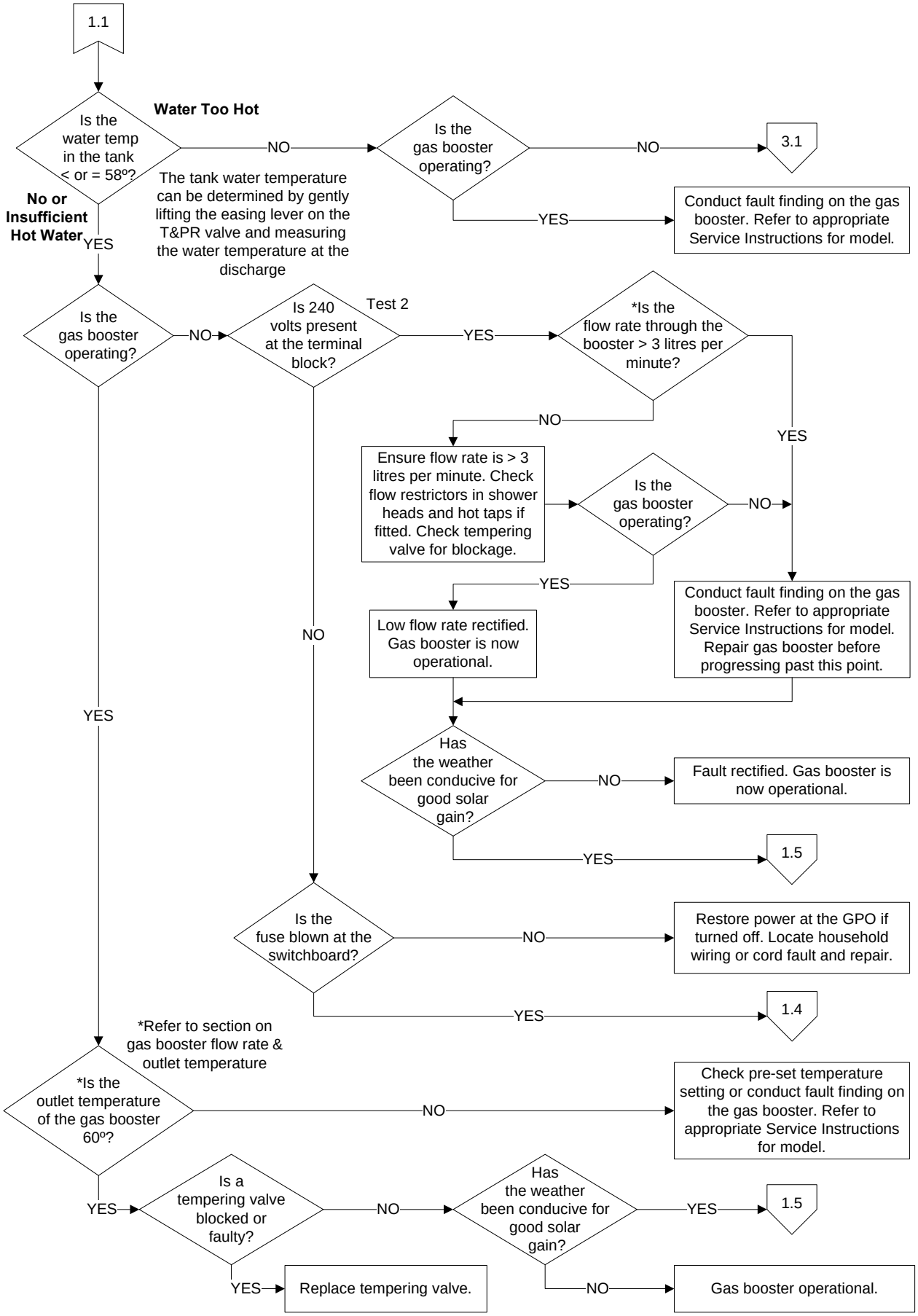
Fault Finding Chart 1.1


1.1
Water Too Hot
Is the water temp in the tank < or = 58ºº?
NO
Is the gas booster operating?
NO
3.1
YES
Conduct fault finding on the gas booster. Refer to appropriate Service Instructions for model.
The tank water temperature can be determined by gently lifting the easing lever on the T&PR valve and measuring the water temperature at the discharge
No or Insufficient Hot Water
YES
Is the gas booster operating?
NO
Is 240 volts present at the terminal block?
Test 2
YES
*Is the flow rate through the booster > 3 litres per minute?
NO
YES
Ensure flow rate is > 3 litres per minute. Check flow restrictors in shower heads and hot taps if fitted. Check tempering valve for blockage.
Is the gas booster operating?
NO
YES
Low flow rate rectified. Gas booster is now operational.
Conduct fault finding on the gas booster. Refer to appropriate Service Instructions for model. Repair gas booster before progressing past this point.
NO
YES
Has the weather been conducive for good solar gain?
NO
Fault rectified. Gas booster is now operational.
YES
1.5
Is the fuse blown at the switchboard?
NO
Restore power at the GPO if turned off. Locate household wiring or cord fault and repair.
YES
1.4
*Refer to section on gas booster flow rate & outlet temperature
*Is the outlet temperature of the gas booster 60ºº?
NO
Check pre-set temperature setting or conduct fault finding on the gas booster. Refer to appropriate Service Instructions for model.
YES
Is a tempering valve blocked or faulty?
NO
Has the weather been conducive for good solar gain?
YES
1.5
YES
Replace tempering valve.
NO
Gas booster operational.

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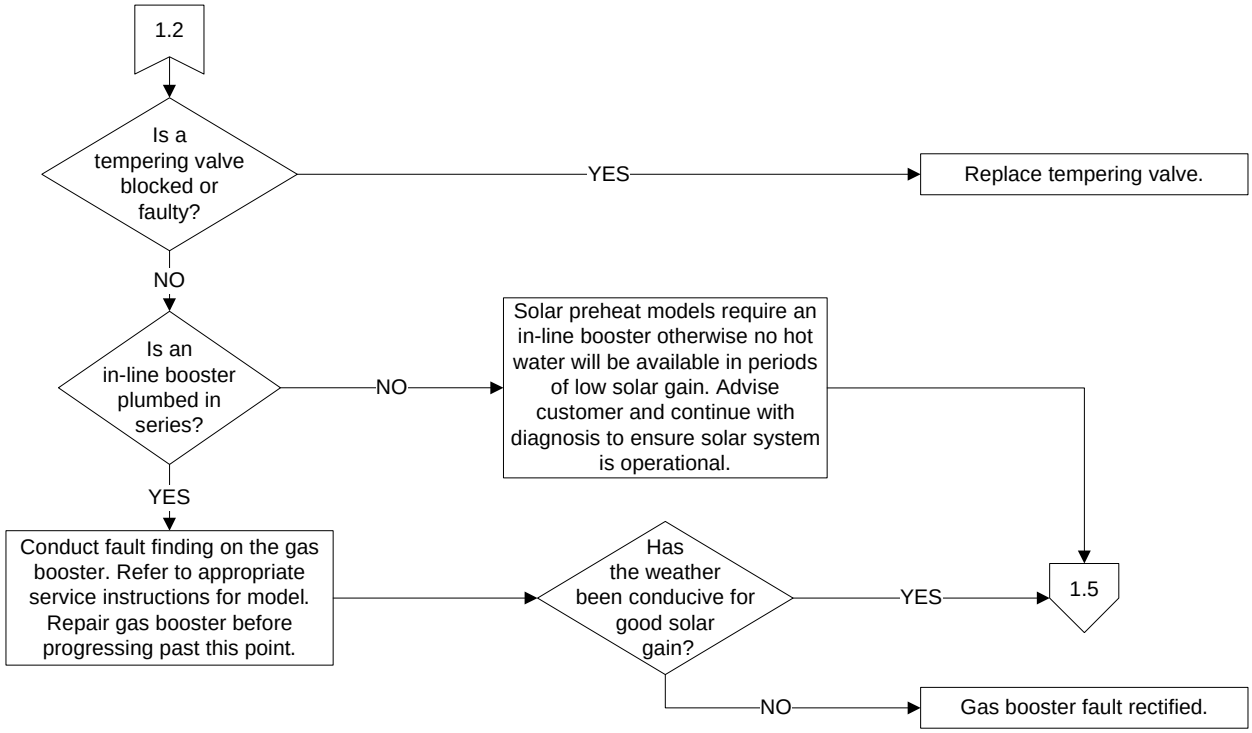
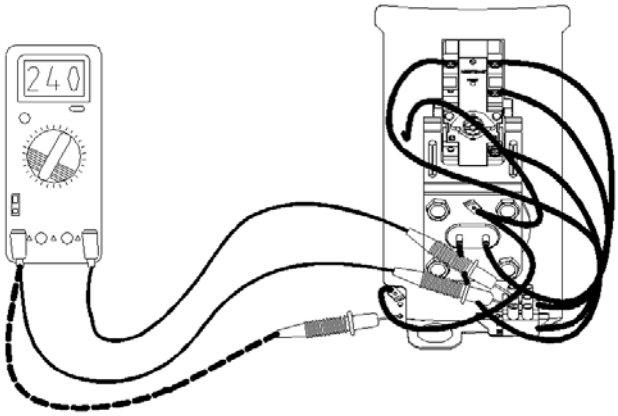
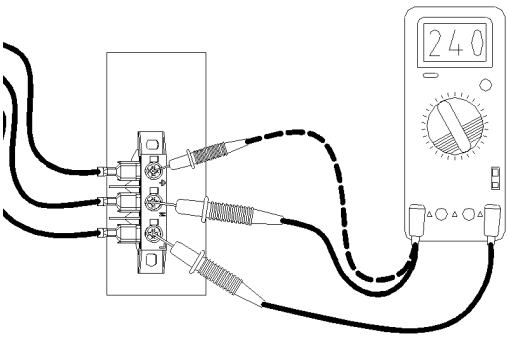
Fault Finding Chart 1.2


1.2
Is a tempering valve blocked or faulty?
YES
Replace tempering valve.
NO
Is an in-line booster plumbed in series?
NO
Solar preheat models require an in-line booster otherwise no hot water will be available in periods of low solar gain. Advise customer and continue with diagnosis to ensure solar system is operational.
YES
Conduct fault finding on the gas booster. Refer to appropriate service instructions for model. Repair gas booster before progressing past this point.
Has the weather been conducive for good solar gain?
YES
1.5
NO
Gas booster fault rectified.

Fault Finding Tests 1 & 2

Test 1	Test 2
	
Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.	***Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.***
Using a multimeter on the AC voltage scale, measure between the terminals of the terminal block located behind the element access cover. The following measurements should be obtained: Active & Neutral – 240 volts. Active & Earth – 240 volts. Neutral & Earth – 0 volts.	Using a multimeter on the AC voltage scale, measure between the terminals of the terminal block located behind the upper electrical access cover. The following measurements should be obtained: Active & Neutral – 240 volts. Active & Earth – 240 volts. Neutral & Earth – 0 volts.

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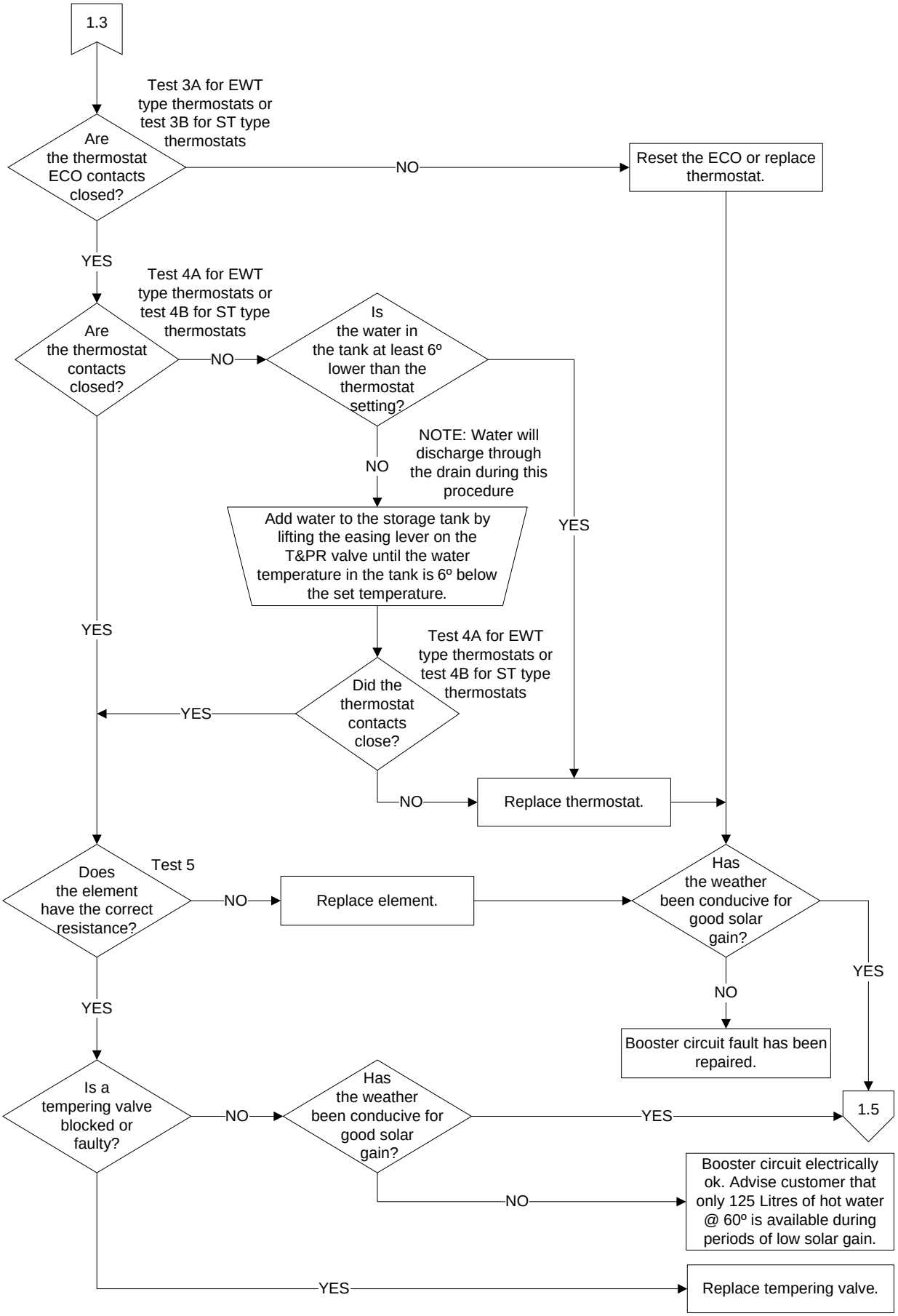
Fault Finding Chart 1.3


1.3
Test 3A for EWT type thermostats or test 3B for ST type thermostats
Are the thermostat ECO contacts closed?
NO
Reset the ECO or replace thermostat.
YES
Test 4A for EWT type thermostats or test 4B for ST type thermostats
Are the thermostat contacts closed?
NO
Is the water in the tank at least 6º lower than the thermostat setting?
NOTE: Water will discharge through the drain during this procedure
NO
Add water to the storage tank by lifting the easing lever on the T&PR valve until the water temperature in the tank is 6º below the set temperature.
YES
YES
Test 4A for EWT type thermostats or test 4B for ST type thermostats
Did the thermostat contacts close?
YES
NO
Replace thermostat.
Test 5
Does the element have the correct resistance?
NO
Replace element.
Has the weather been conducive for good solar gain?
YES
NO
Booster circuit fault has been repaired.
YES
Is a tempering valve blocked or faulty?
NO
Has the weather been conducive for good solar gain?
YES
1.5
NO
Booster circuit electrically ok. Advise customer that only 125 Litres of hot water @ 60º is available during periods of low solar gain.
YES
Replace tempering valve.

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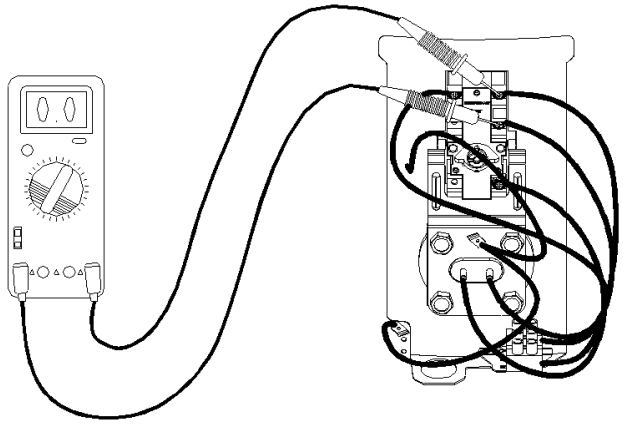
Fault Finding Tests 3A – 4B

Test 3A – EWT Type Thermostat

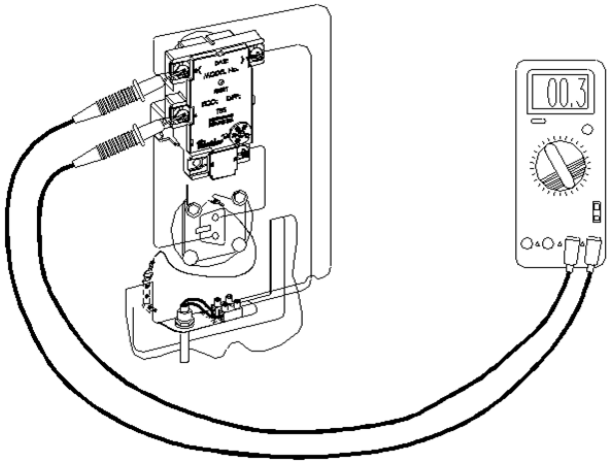


Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

3L & 4L – 0 ohms.

Test 3B – ST Type Thermostat

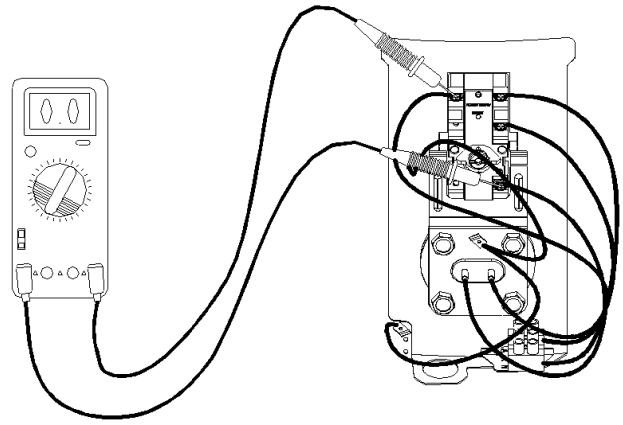


Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

3 & 4 – 0 ohms.

Test 4A – EWT Type Thermostat

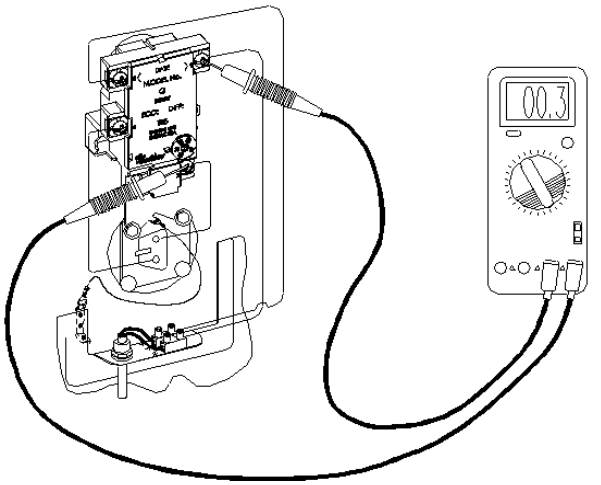


Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

1L & 2T – 0 ohms.

Test 4B – ST Type Thermostat



Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the terminals of the mechanical thermostat. The following results should be obtained:

1 & 2 – 0 ohms.

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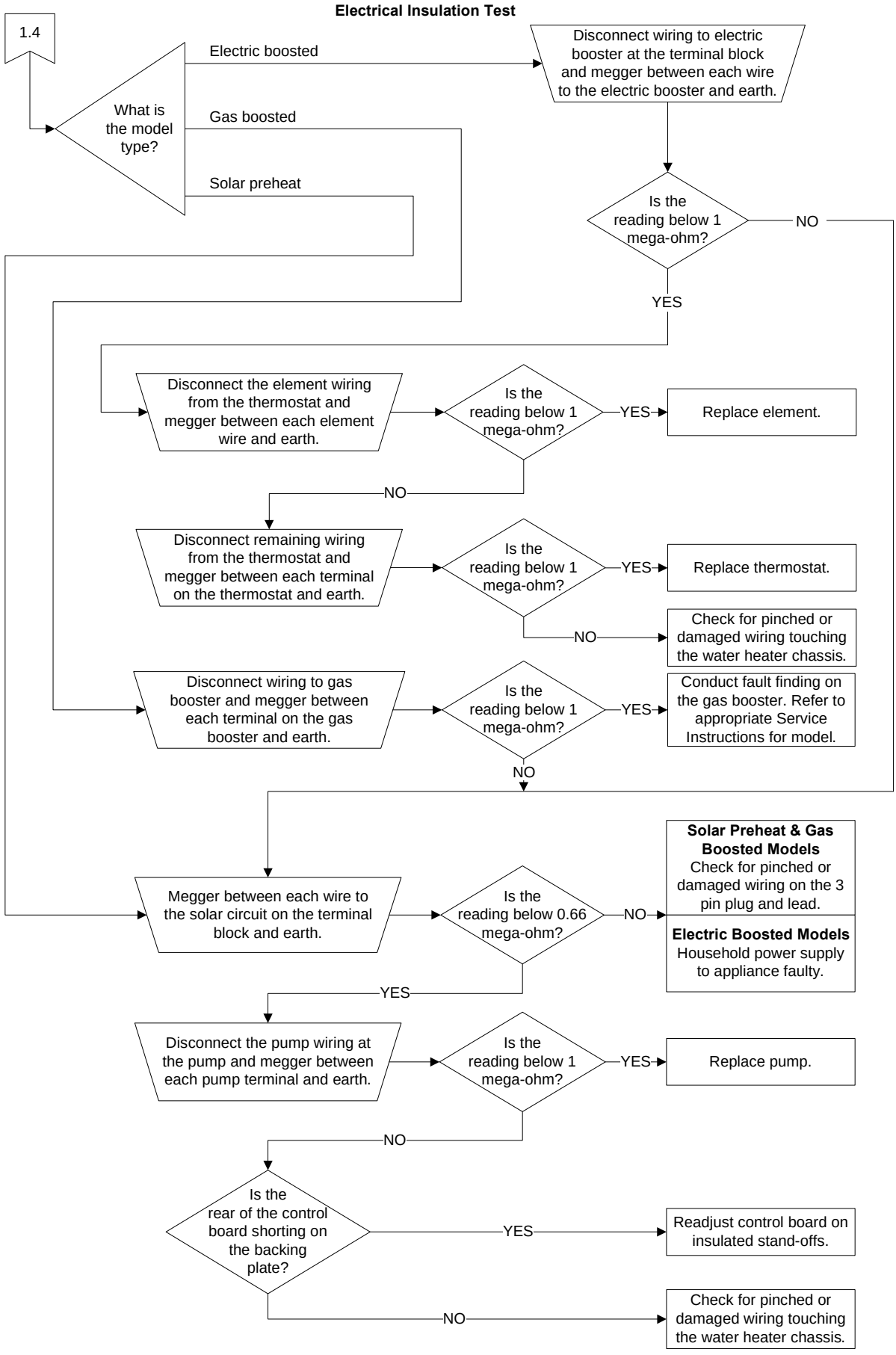
Fault Finding Chart 1.4


Electrical Insulation Test
1.4
What is the model type?
Electric boosted
Gas boosted
Solar preheat
Disconnect wiring to electric booster at the terminal block and megger between each wire to the electric booster and earth.
Is the reading below 1 mega-ohm?
NO
YES
Disconnect the element wiring from the thermostat and megger between each element wire and earth.
Is the reading below 1 mega-ohm?
YES
Replace element.
NO
Disconnect remaining wiring from the thermostat and megger between each terminal on the thermostat and earth.
Is the reading below 1 mega-ohm?
YES
Replace thermostat.
NO
Check for pinched or damaged wiring touching the water heater chassis.
Disconnect wiring to gas booster and megger between each terminal on the gas booster and earth.
Is the reading below 1 mega-ohm?
YES
Conduct fault finding on the gas booster. Refer to appropriate Service Instructions for model.
NO
Megger between each wire to the solar circuit on the terminal block and earth.
Is the reading below 0.66 mega-ohm?
NO
Solar Preheat & Gas Boosted Models
Check for pinched or damaged wiring on the 3 pin plug and lead.
Electric Boosted Models
Household power supply to appliance faulty.
YES
Disconnect the pump wiring at the pump and megger between each pump terminal and earth.
Is the reading below 1 mega-ohm?
YES
Replace pump.
NO
Is the rear of the control board shorting on the backing plate?
YES
Readjust control board on insulated stand-offs.
NO
Check for pinched or damaged wiring touching the water heater chassis.

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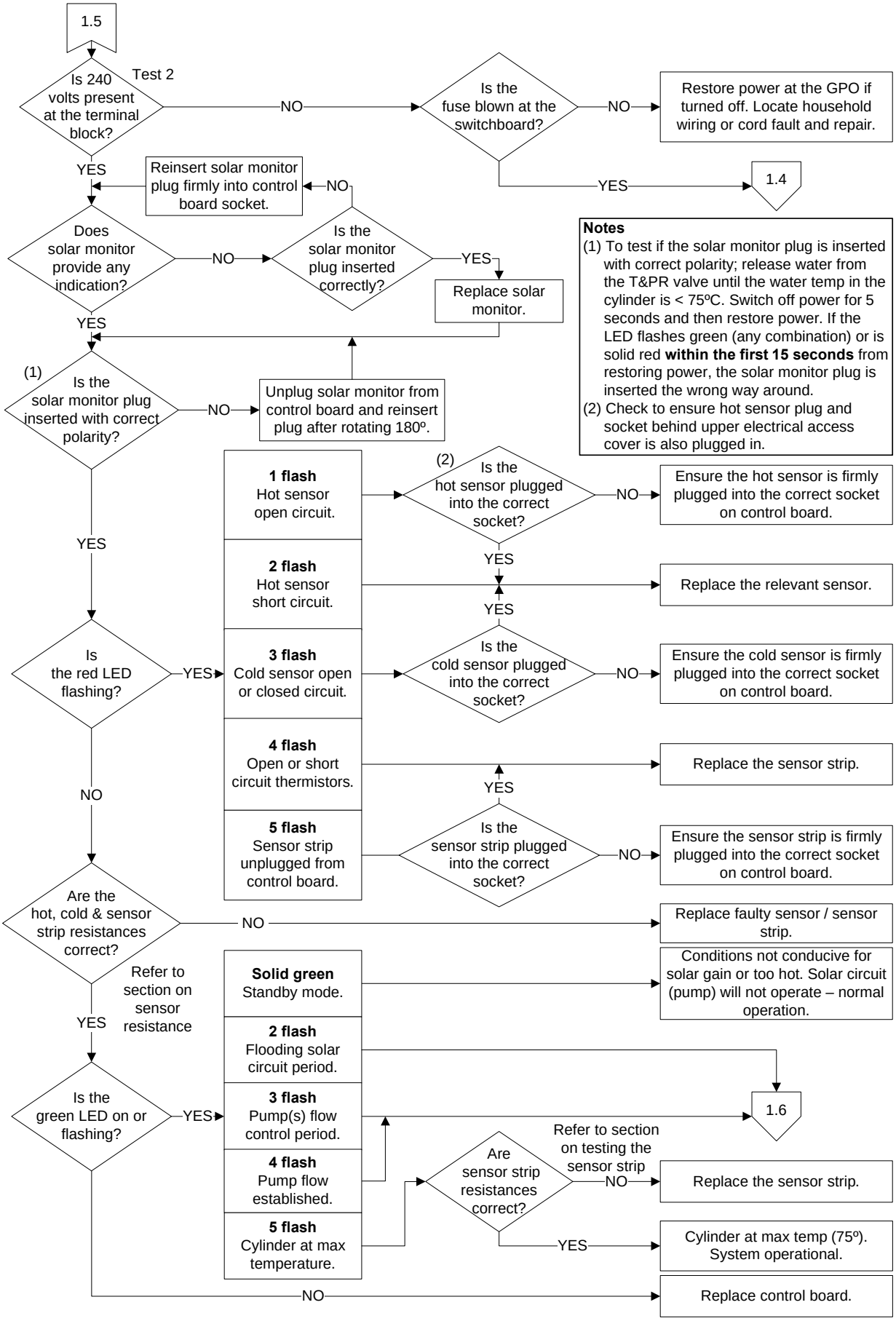
Fault Finding Chart 1.5


1.5
Is 240 volts present at the terminal block?
Test 2
NO
Is the fuse blown at the switchboard?
NO
Restore power at the GPO if turned off. Locate household wiring or cord fault and repair.
YES
YES
1.4
Reinsert solar monitor plug firmly into control board socket.
NO
Does solar monitor provide any indication?
NO
Is the solar monitor plug inserted correctly?
YES
Replace solar monitor.
YES
Notes
(1) To test if the solar monitor plug is inserted with correct polarity; release water from the T&PR valve until the water temp in the cylinder is < 75ºC. Switch off power for 5 seconds and then restore power. If the LED flashes green (any combination) or is solid red within the first 15 seconds from restoring power, the solar monitor plug is inserted the wrong way around.
(2) Check to ensure hot sensor plug and socket behind upper electrical access cover is also plugged in.
(1)
Is the solar monitor plug inserted with correct polarity?
NO
Unplug solar monitor from control board and reinsert plug after rotating 180º.
YES
Is the red LED flashing?
YES
1 flash Hot sensor open circuit.
2 flash Hot sensor short circuit.
3 flash Cold sensor open or closed circuit.
4 flash Open or short circuit thermistors.
5 flash Sensor strip unplugged from control board.
(2)
Is the hot sensor plugged into the correct socket?
NO
Ensure the hot sensor is firmly plugged into the correct socket on control board.
YES
Replace the relevant sensor.
YES
Is the cold sensor plugged into the correct socket?
NO
Ensure the cold sensor is firmly plugged into the correct socket on control board.
Replace the sensor strip.
YES
Is the sensor strip plugged into the correct socket?
NO
Ensure the sensor strip is firmly plugged into the correct socket on control board.
NO
Are the hot, cold & sensor strip resistances correct?
NO
Replace faulty sensor / sensor strip.
Refer to section on sensor resistance
YES
Solid green Standby mode.
2 flash Flooding solar circuit period.
3 flash Pump(s) flow control period.
4 flash Pump flow established.
5 flash Cylinder at max temperature.
Conditions not conducive for solar gain or too hot. Solar circuit (pump) will not operate – normal operation.
Is the green LED on or flashing?
YES
1.6
Refer to section on testing the sensor strip
Are sensor strip resistances correct?
NO
Replace the sensor strip.
YES
Cylinder at max temp (75º). System operational.
NO
Replace control board.

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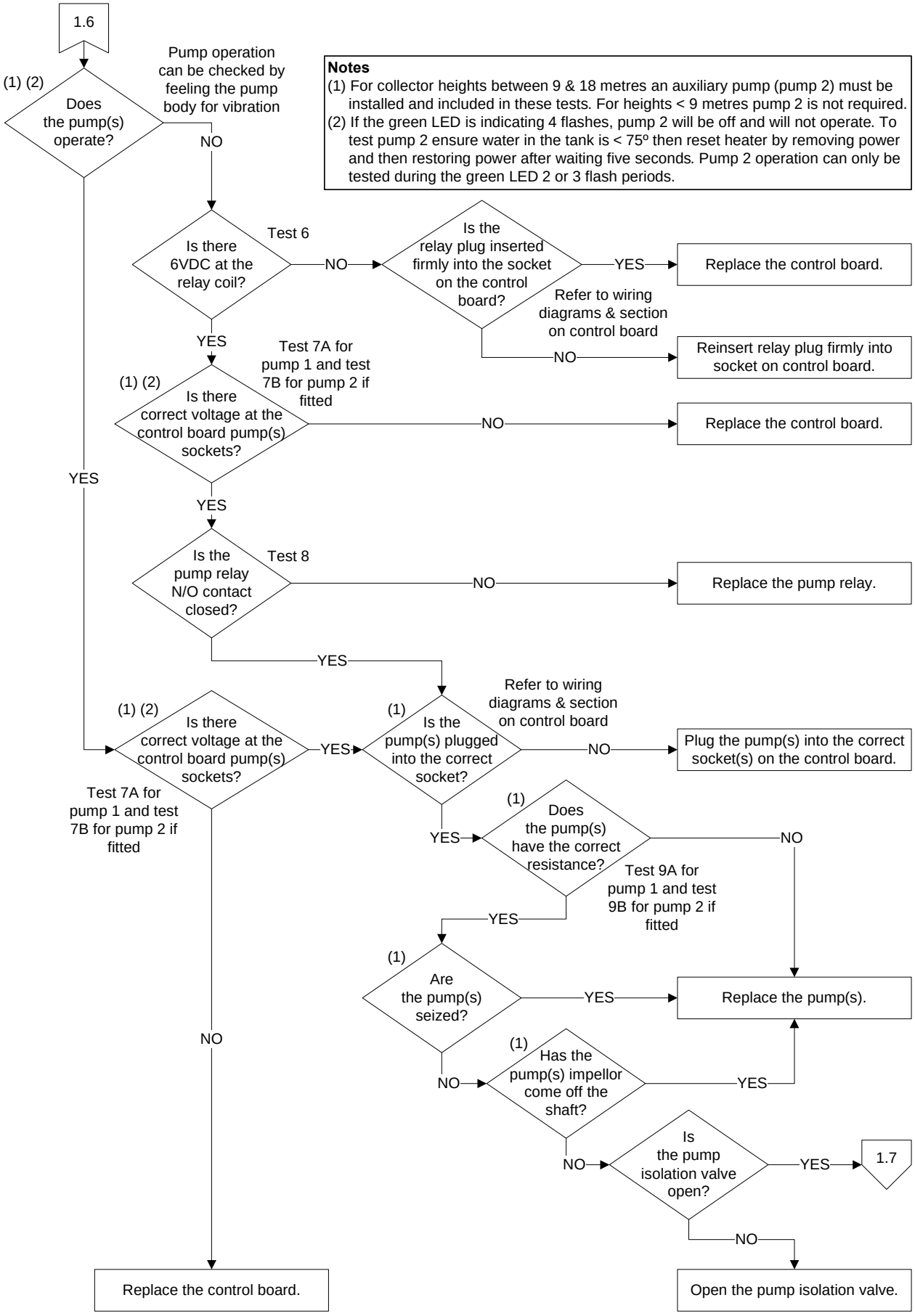
Fault Finding Chart 1.6


1.6
(1) (2)
Does the pump(s) operate?
Pump operation can be checked by feeling the pump body for vibration
NO
YES
Notes
(1) For collector heights between 9 & 18 metres an auxiliary pump (pump 2) must be installed and included in these tests. For heights < 9 metres pump 2 is not required.
(2) If the green LED is indicating 4 flashes, pump 2 will be off and will not operate. To test pump 2 ensure water in the tank is < 75º then reset heater by removing power and then restoring power after waiting five seconds. Pump 2 operation can only be tested during the green LED 2 or 3 flash periods.
Is there 6VDC at the relay coil?
Test 6
NO
Is the relay plug inserted firmly into the socket on the control board?
YES
Replace the control board.
Refer to wiring diagrams & section on control board
NO
Reinsert relay plug firmly into socket on control board.
YES
(1) (2)
Is there correct voltage at the control board pump(s) sockets?
Test 7A for pump 1 and test 7B for pump 2 if fitted
NO
Replace the control board.
YES
YES
Is the pump relay N/O contact closed?
Test 8
NO
Replace the pump relay.
YES
(1) (2)
Is there correct voltage at the control board pump(s) sockets?
YES
(1)
Is the pump(s) plugged into the correct socket?
Refer to wiring diagrams & section on control board
NO
Plug the pump(s) into the correct socket(s) on the control board.
Test 7A for pump 1 and test 7B for pump 2 if fitted
YES
(1)
Does the pump(s) have the correct resistance?
NO
Test 9A for pump 1 and test 9B for pump 2 if fitted
YES
(1)
Are the pump(s) seized?
YES
Replace the pump(s).
NO
NO
(1)
Has the pump(s) impellor come off the shaft?
YES
NO
Is the pump isolation valve open?
YES
1.7
NO
Replace the control board.
Open the pump isolation valve.

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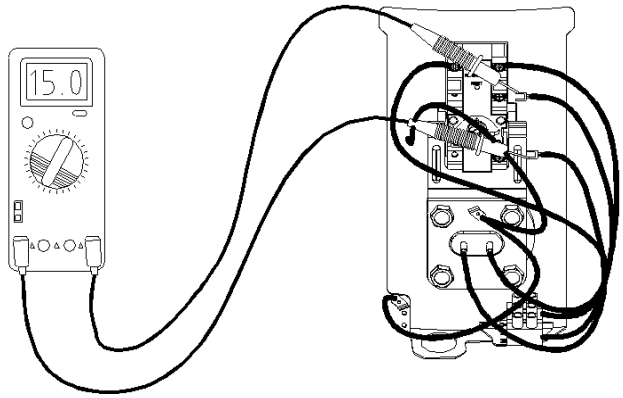
Fault Finding Tests 5 – 7B

Test 5

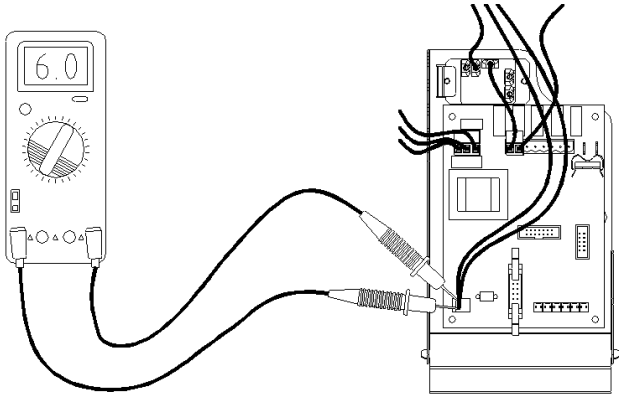


Warning - Ensure power is isolated before conducting this test.

Disconnect the element wires from the thermostat, and using a multimeter on the ohms scale, measure between the two element wires. The following results should be obtained:

2.4kW element: 22 – 26 ohms.
3.6kW element: 15 – 17 ohms.
4.8kW element: 11 – 13 ohms.

Test 6

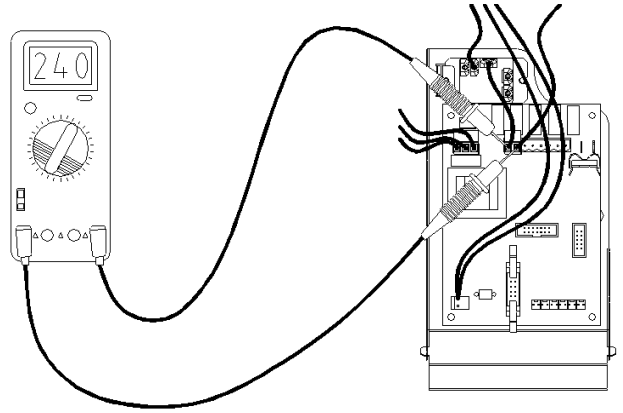


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the DC voltage scale, measure between the two wires on the control board relay plug.

Normal voltage is 6 Volts DC.

Test 7A – Pump 1

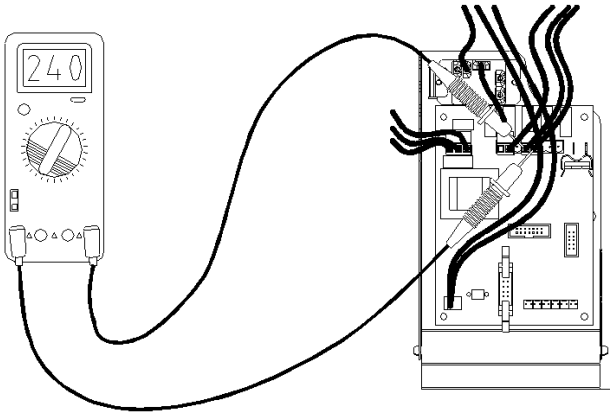


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a digital multimeter on the AC voltage scale, measure between the two wires on the pump 1 plug socket.

Normal voltage is 240 Volts AC.

Test 7B – Pump 2



Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a digital multimeter on the AC voltage scale, measure between the two wires on the pump 2 plug socket.

Normal voltage is 240 Volts AC.

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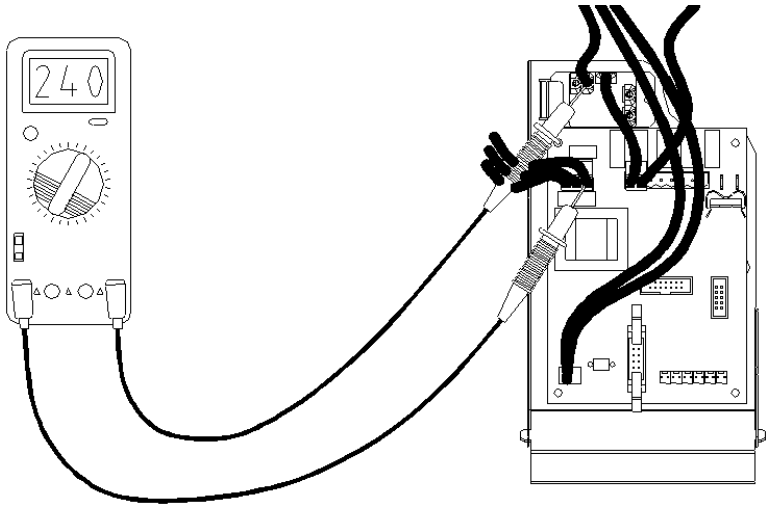
Fault Finding Tests 8 – 9B

Test 8

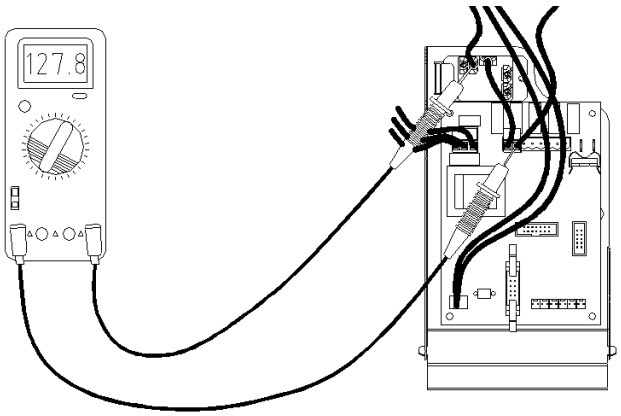


Warning – 'Live' equipment wear Personal Protective Equipment when conducting this test.

Using a multimeter on the AC voltage scale, measure between the N/O terminal of the pump relay and neutral on the control board power supply plug.

Normal reading is 240 Volts.

Test 9A – Pump 1

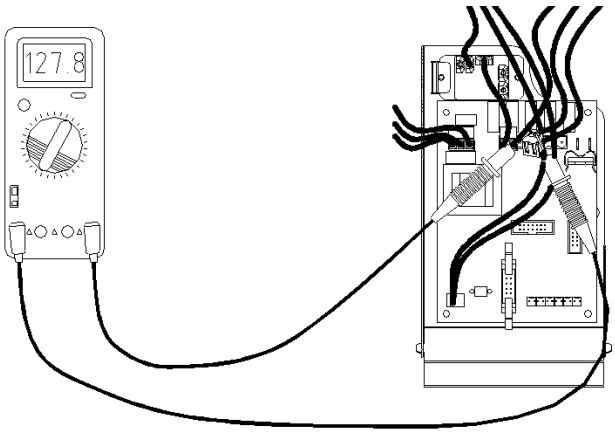


Warning - Ensure power is isolated before conducting this test.

Using a multimeter on the ohms scale, measure between the N/O terminal of the pump relay and the first terminal on the right of the pump 1 plug socket.

Normal reading is 127.8 ohms.

Test 9B – Pump 2



Warning - Ensure power is isolated before conducting this test.

Disconnect the pump 2 plug socket from the control board and using a multimeter on the ohms scale, measure between the two terminals of the pump 2 plug socket.

Normal reading is 127.8 ohms.

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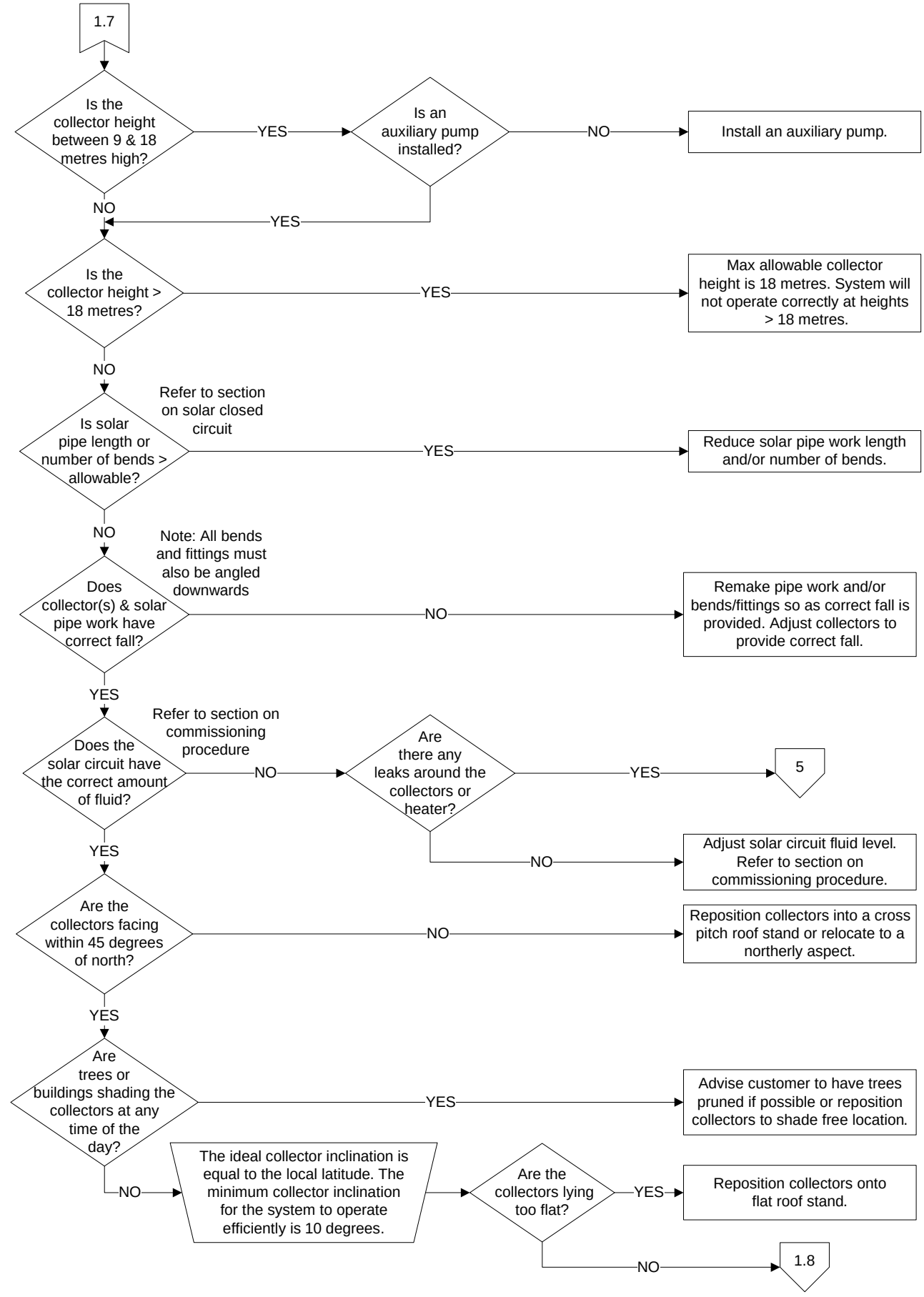
Fault Finding Chart 1.7


1.7
Is the collector height between 9 & 18 metres high?
YES
Is an auxiliary pump installed?
NO
Install an auxiliary pump.
YES
NO
Is the collector height > 18 metres?
YES
Max allowable collector height is 18 metres. System will not operate correctly at heights > 18 metres.
NO
Refer to section on solar closed circuit
Is solar pipe length or number of bends > allowable?
YES
Reduce solar pipe work length and/or number of bends.
NO
Note: All bends and fittings must also be angled downwards
Does collector(s) & solar pipe work have correct fall?
NO
Remake pipe work and/or bends/fittings so as correct fall is provided. Adjust collectors to provide correct fall.
YES
Refer to section on commissioning procedure
Does the solar circuit have the correct amount of fluid?
NO
Are there any leaks around the collectors or heater?
YES
5
NO
Adjust solar circuit fluid level. Refer to section on commissioning procedure.
YES
Are the collectors facing within 45 degrees of north?
NO
Reposition collectors into a cross pitch roof stand or relocate to a northerly aspect.
YES
Are trees or buildings shading the collectors at any time of the day?
YES
Advise customer to have trees pruned if possible or reposition collectors to shade free location.
NO
The ideal collector inclination is equal to the local latitude. The minimum collector inclination for the system to operate efficiently is 10 degrees.
Are the collectors lying too flat?
YES
Reposition collectors onto flat roof stand.
NO
1.8

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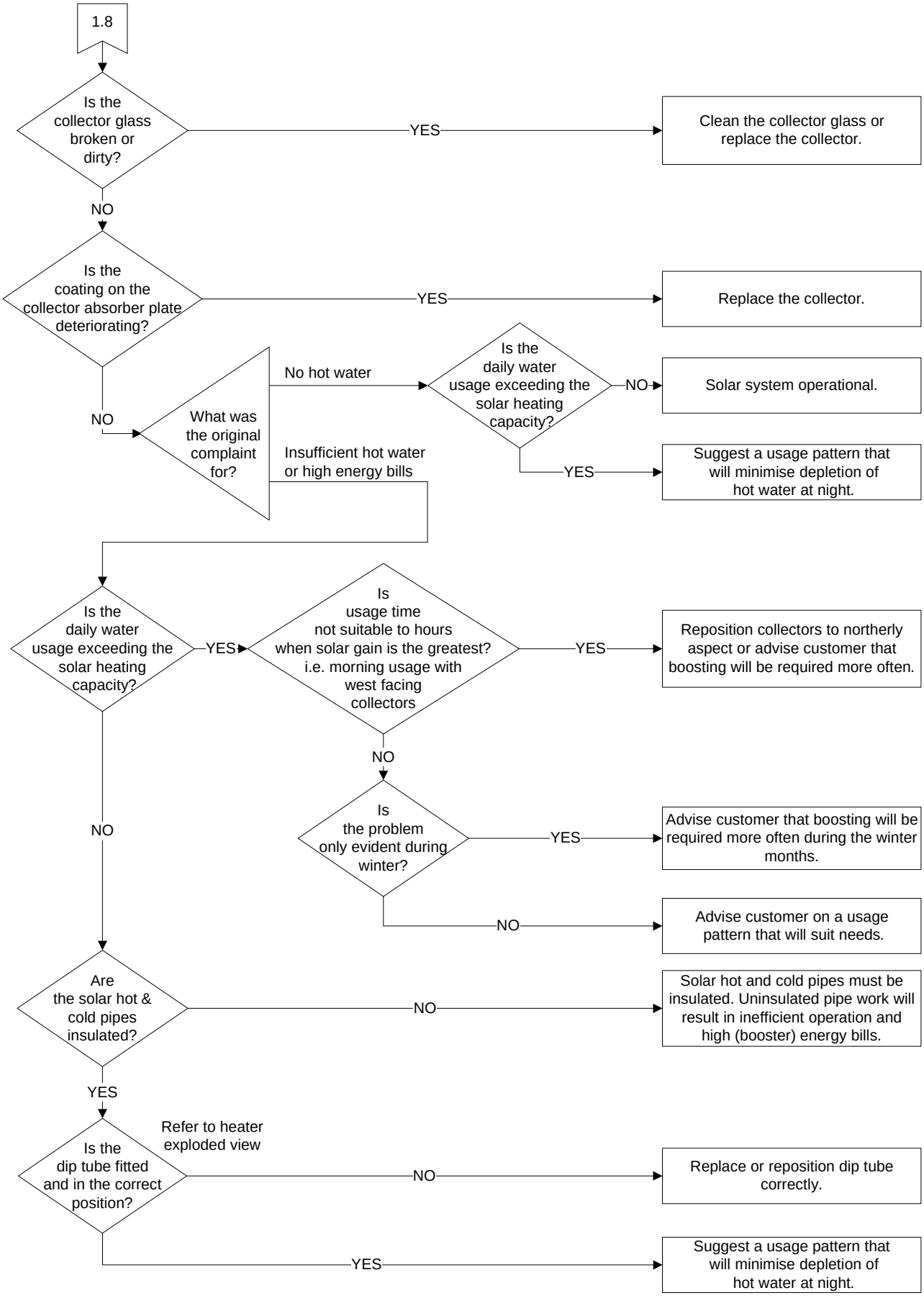
Fault Finding Chart 1.8


1.8
Is the collector glass broken or dirty?
YES
Clean the collector glass or replace the collector.
NO
Is the coating on the collector absorber plate deteriorating?
YES
Replace the collector.
NO
What was the original complaint for?
No hot water
Is the daily water usage exceeding the solar heating capacity?
NO
Solar system operational.
YES
Suggest a usage pattern that will minimise depletion of hot water at night.
Insufficient hot water or high energy bills
Is the daily water usage exceeding the solar heating capacity?
YES
Is usage time not suitable to hours when solar gain is the greatest? i.e. morning usage with west facing collectors
YES
Reposition collectors to northerly aspect or advise customer that boosting will be required more often.
NO
Is the problem only evident during winter?
YES
Advise customer that boosting will be required more often during the winter months.
NO
Advise customer on a usage pattern that will suit needs.
NO
Are the solar hot & cold pipes insulated?
NO
Solar hot and cold pipes must be insulated. Uninsulated pipe work will result in inefficient operation and high (booster) energy bills.
YES
Refer to heater exploded view
Is the dip tube fitted and in the correct position?
NO
Replace or reposition dip tube correctly.
YES
Suggest a usage pattern that will minimise depletion of hot water at night.

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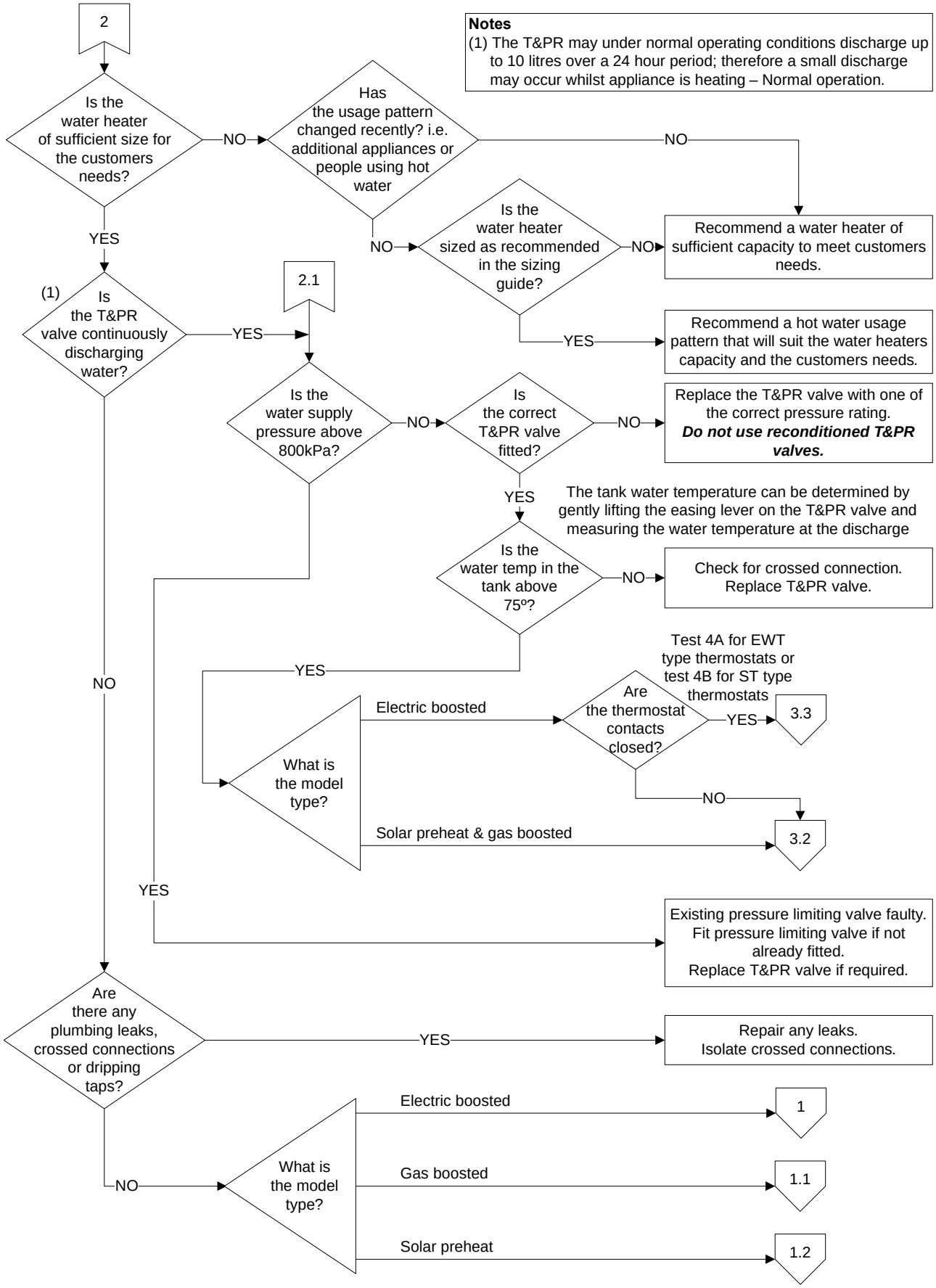
Fault Finding Chart 2 & 2.1


2
Notes
(1) The T&PR may under normal operating conditions discharge up to 10 litres over a 24 hour period; therefore a small discharge may occur whilst appliance is heating – Normal operation.
Is the water heater of sufficient size for the customers needs?
NO
Has the usage pattern changed recently? i.e. additional appliances or people using hot water
NO
Recommend a water heater of sufficient capacity to meet customers needs.
YES
NO
Is the water heater sized as recommended in the sizing guide?
NO
YES
Recommend a hot water usage pattern that will suit the water heaters capacity and the customers needs.
(1)
Is the T&PR valve continuously discharging water?
YES
2.1
Is the water supply pressure above 800kPa?
NO
Is the correct T&PR valve fitted?
NO
Replace the T&PR valve with one of the correct pressure rating.
Do not use reconditioned T&PR valves.
YES
The tank water temperature can be determined by gently lifting the easing lever on the T&PR valve and measuring the water temperature at the discharge
Is the water temp in the tank above 75º?
NO
Check for crossed connection.
Replace T&PR valve.
YES
Test 4A for EWT type thermostats or test 4B for ST type thermostats
NO
YES
What is the model type?
Electric boosted
Are the thermostat contacts closed?
YES
3.3
NO
3.2
Solar preheat & gas boosted
YES
Existing pressure limiting valve faulty.
Fit pressure limiting valve if not already fitted.
Replace T&PR valve if required.
Are there any plumbing leaks, crossed connections or dripping taps?
YES
Repair any leaks.
Isolate crossed connections.
NO
What is the model type?
Electric boosted
1
Gas boosted
1.1
Solar preheat
1.2

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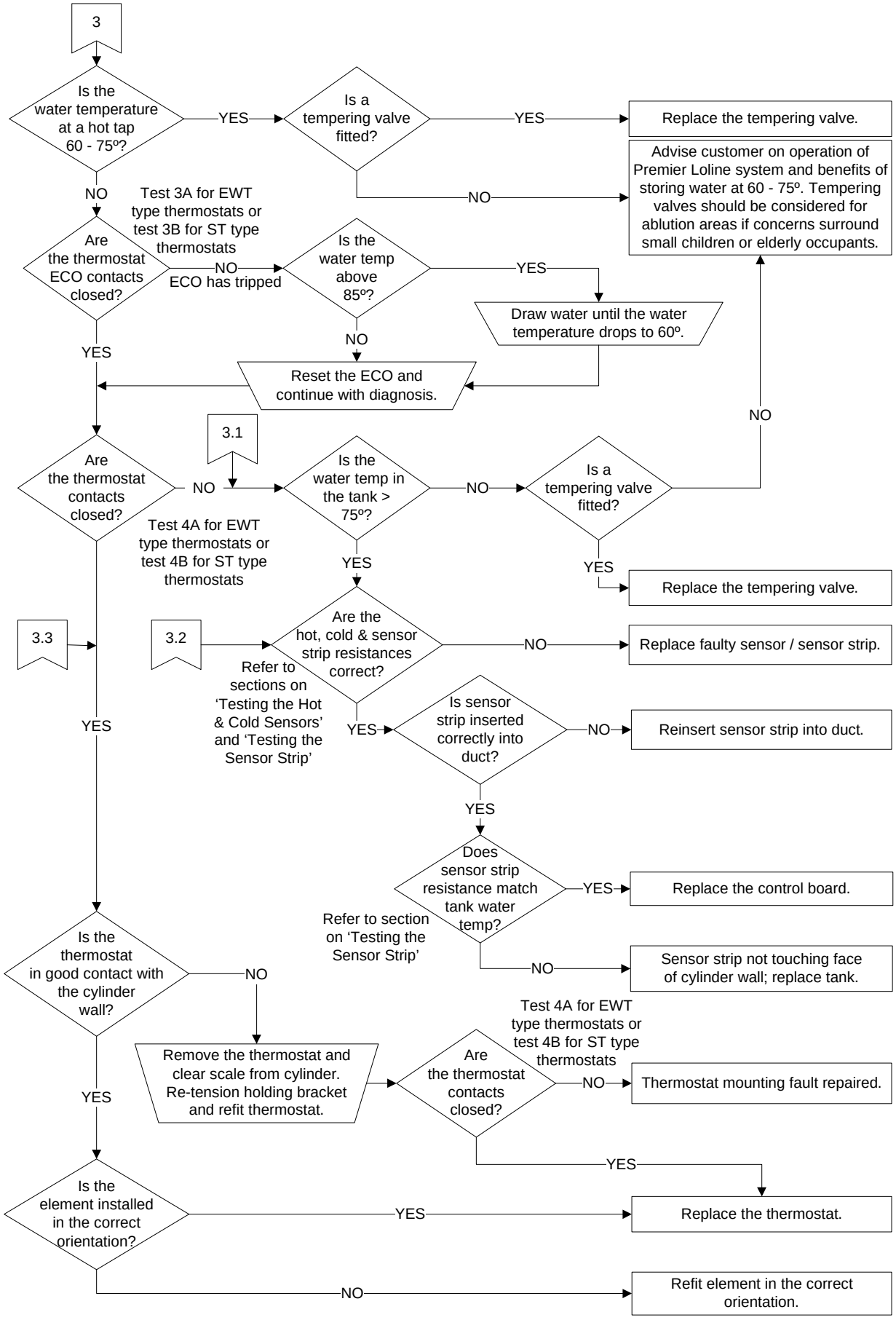
Fault Finding Chart 3, 3.1, 3.2 & 3.3


3
Is the water temperature at a hot tap 60 - 75º?
YES
Is a tempering valve fitted?
YES
Replace the tempering valve.
NO
Advise customer on operation of Premier Loline system and benefits of storing water at 60 - 75º. Tempering valves should be considered for ablution areas if concerns surround small children or elderly occupants.
NO
Test 3A for EWT type thermostats or test 3B for ST type thermostats
Are the thermostat ECO contacts closed?
NO
ECO has tripped
Is the water temp above 85º?
YES
Draw water until the water temperature drops to 60º.
NO
YES
Reset the ECO and continue with diagnosis.
NO
3.1
Are the thermostat contacts closed?
NO
Is the water temp in the tank > 75º?
NO
Is a tempering valve fitted?
Test 4A for EWT type thermostats or test 4B for ST type thermostats
YES
YES
Replace the tempering valve.
3.3
3.2
Are the hot, cold & sensor strip resistances correct?
NO
Replace faulty sensor / sensor strip.
Refer to sections on 'Testing the Hot & Cold Sensors' and 'Testing the Sensor Strip'
YES
Is sensor strip inserted correctly into duct?
NO
Reinsert sensor strip into duct.
YES
YES
Does sensor strip resistance match tank water temp?
YES
Replace the control board.
Refer to section on 'Testing the Sensor Strip'
NO
Sensor strip not touching face of cylinder wall; replace tank.
Is the thermostat in good contact with the cylinder wall?
NO
Test 4A for EWT type thermostats or test 4B for ST type thermostats
Remove the thermostat and clear scale from cylinder. Re-tension holding bracket and refit thermostat.
Are the thermostat contacts closed?
NO
Thermostat mounting fault repaired.
YES
YES
Is the element installed in the correct orientation?
YES
Replace the thermostat.
NO
Refit element in the correct orientation.

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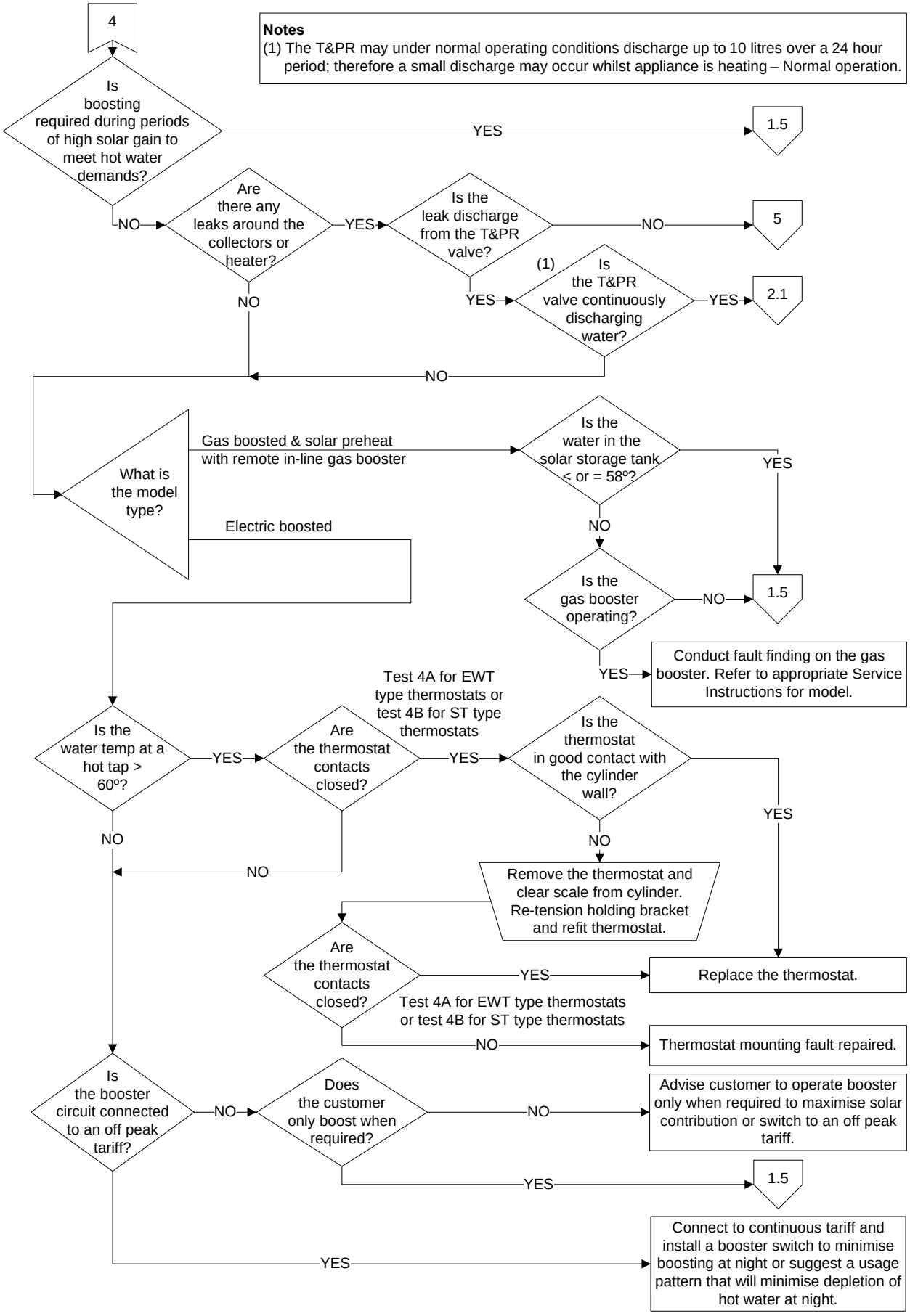
Fault Finding Chart 4


4
Notes
(1) The T&PR may under normal operating conditions discharge up to 10 litres over a 24 hour period; therefore a small discharge may occur whilst appliance is heating – Normal operation.
Is boosting required during periods of high solar gain to meet hot water demands?
YES
1.5
NO
Are there any leaks around the collectors or heater?
YES
Is the leak discharge from the T&PR valve?
NO
5
NO
YES
(1) Is the T&PR valve continuously discharging water?
YES
2.1
NO
What is the model type?
Gas boosted & solar preheat with remote in-line gas booster
Is the water in the solar storage tank < or = 58º?
YES
NO
Electric boosted
Is the gas booster operating?
NO
1.5
YES
Conduct fault finding on the gas booster. Refer to appropriate Service Instructions for model.
Test 4A for EWT type thermostats or test 4B for ST type thermostats
Is the water temp at a hot tap > 60º?
YES
Are the thermostat contacts closed?
YES
Is the thermostat in good contact with the cylinder wall?
YES
NO
NO
NO
Remove the thermostat and clear scale from cylinder. Re-tension holding bracket and refit thermostat.
Are the thermostat contacts closed?
YES
Replace the thermostat.
Test 4A for EWT type thermostats or test 4B for ST type thermostats
NO
Thermostat mounting fault repaired.
Is the booster circuit connected to an off peak tariff?
NO
Does the customer only boost when required?
NO
Advise customer to operate booster only when required to maximise solar contribution or switch to an off peak tariff.
YES
1.5
YES
Connect to continuous tariff and install a booster switch to minimise boosting at night or suggest a usage pattern that will minimise depletion of hot water at night.

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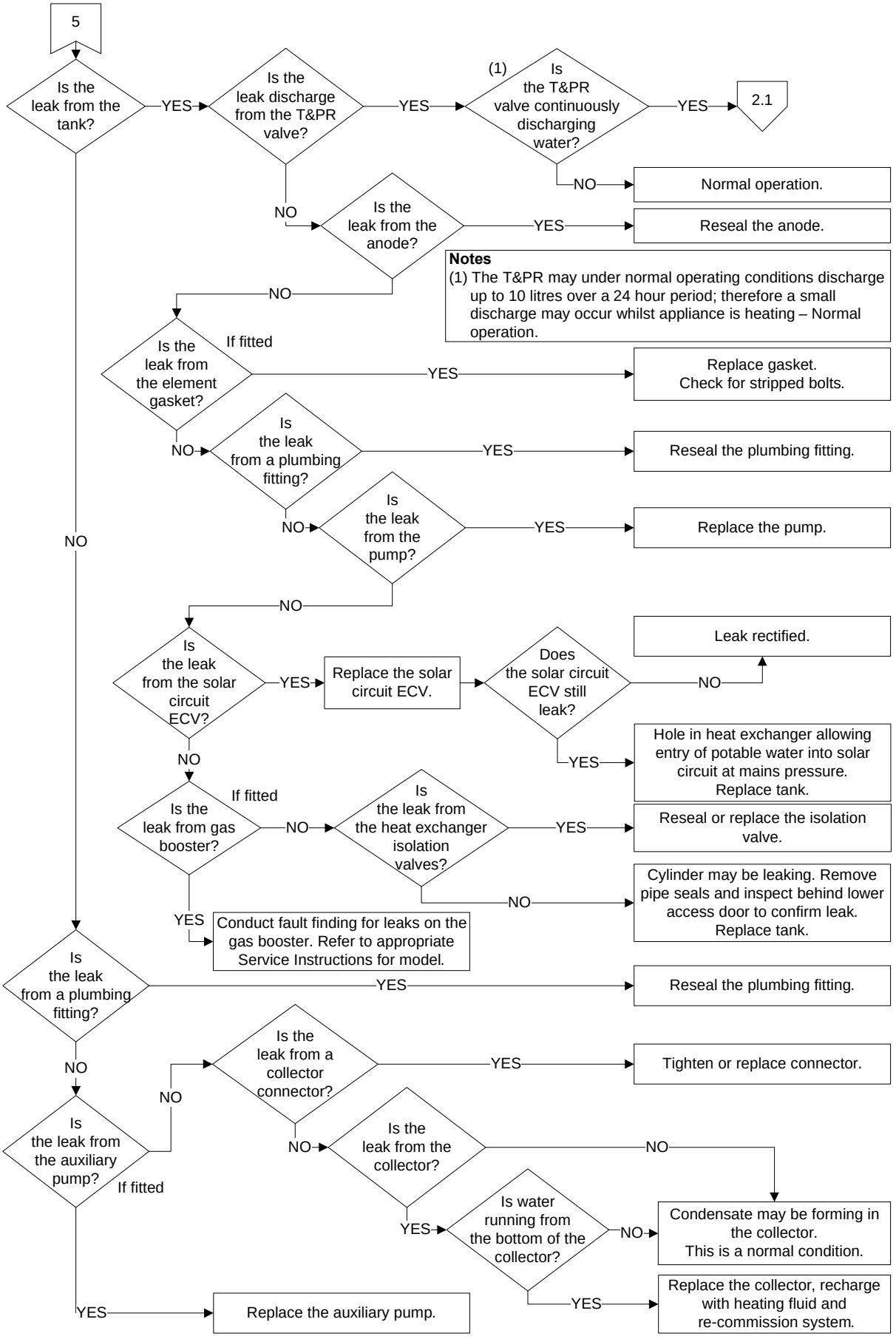
Fault Finding Chart 5


5
Is the leak from the tank?
YES
Is the leak discharge from the T&PR valve?
YES
(1) Is the T&PR valve continuously discharging water?
YES
2.1
NO
Normal operation.
NO
Is the leak from the anode?
YES
Reseal the anode.
NO
Is the leak from the element gasket?
If fitted
YES
Replace gasket. Check for stripped bolts.
NO
Is the leak from a plumbing fitting?
YES
Reseal the plumbing fitting.
NO
Is the leak from the pump?
YES
Replace the pump.
NO
NO
Is the leak from the solar circuit ECV?
YES
Replace the solar circuit ECV.
Does the solar circuit ECV still leak?
NO
Leak rectified.
YES
Hole in heat exchanger allowing entry of potable water into solar circuit at mains pressure. Replace tank.
NO
Is the leak from gas booster?
If fitted
NO
Is the leak from the heat exchanger isolation valves?
YES
Reseal or replace the isolation valve.
NO
Cylinder may be leaking. Remove pipe seals and inspect behind lower access door to confirm leak. Replace tank.
YES
Conduct fault finding for leaks on the gas booster. Refer to appropriate Service Instructions for model.
Is the leak from a plumbing fitting?
YES
Reseal the plumbing fitting.
NO
Is the leak from a collector connector?
YES
Tighten or replace connector.
NO
Is the leak from the auxiliary pump?
If fitted
NO
Is the leak from the collector?
NO
YES
Is water running from the bottom of the collector?
NO
Condensate may be forming in the collector. This is a normal condition.
YES
Replace the collector, recharge with heating fluid and re-commission system.
YES
Replace the auxiliary pump.
Notes
(1) The T&PR may under normal operating conditions discharge up to 10 litres over a 24 hour period; therefore a small discharge may occur whilst appliance is heating – Normal operation.

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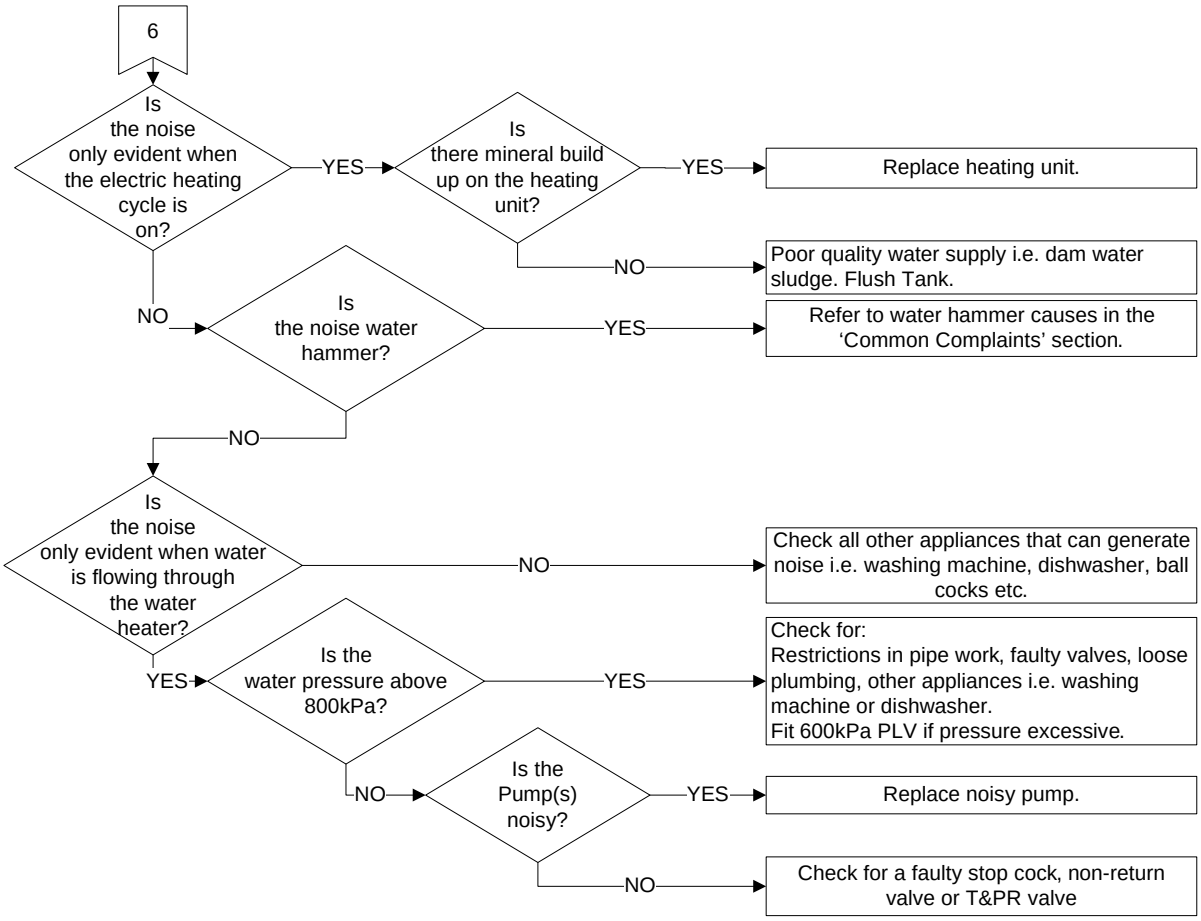
Fault Finding Chart 6


6
Is the noise only evident when the electric heating cycle is on?
YES
Is there mineral build up on the heating unit?
YES
Replace heating unit.
NO
Poor quality water supply i.e. dam water sludge. Flush Tank.
NO
Is the noise water hammer?
YES
Refer to water hammer causes in the 'Common Complaints' section.
NO
Is the noise only evident when water is flowing through the water heater?
NO
Check all other appliances that can generate noise i.e. washing machine, dishwasher, ball cocks etc.
YES
Is the water pressure above 800kPa?
YES
Check for:
Restrictions in pipe work, faulty valves, loose plumbing, other appliances i.e. washing machine or dishwasher.
Fit 600kPa PLV if pressure excessive.
NO
Is the Pump(s) noisy?
YES
Replace noisy pump.
NO
Check for a faulty stop cock, non-return valve or T&PR valve

Gas Booster Flow Rate and Outlet Temperature – Gas Boosted Models Only

To view the gas booster flow rate and the preset outlet temperature:

Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

1. Remove the front panel from the gas booster water heater.
2. Using an insulated tool, turn DIP SWITCH 1 on (up position). Refer to figure 1.
3. Press the MIN button until left digit in the display reads:
   1 – (To view flow rate) or 5 – (To view outlet temp).
4. Press the MAX button until the right digit in the display reads Y.
   The maintenance code 1Y (Flow Rate) or 5Y (Outlet Temp) and the value of that code will now be alternating on the LED display.
5. Turn DIP SWITCH 1 off (down position) when diagnosis is complete.
6. Refit the front panel to the gas booster water heater.

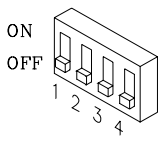


Figure 1

Adjusting the Gas Booster Preset Outlet Temperature

Gas boosters supplied with gas boosted models are factory preset to deliver 60ºC water however it is possible to alter this setting. If for some reason the outlet temperature has been altered it must be changed back to 60ºC for the system to operate correctly; to do this perform the following procedure:

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Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

1. Remove the front cover from the water heater.
2. Turn DIP SWITCHES 3 and 4 on (up position) on the I.C. Board. The current preset temperature is displayed on the LED.
3. Press the MIN or MAX button, located under the DIP Switches, until 60ºC is displayed.
4. Turn DIP SWITCHES 3 and 4 off (down position). The temperature display is now turned off.
5. Refit the front cover to the water heater.

Electrical Insulation Testing

There are three basic test procedures that should be carried out when the operation and function of a Streamline water heater's electrical system is in doubt.

Wear Personal Protective Equipment when conducting step 1 of these procedures to reduce the risk of electric shock. Refer to Rheem safety procedure on electrical testing.

Solar Preheat & Gas Boosted Models

Procedure 1: Insulation resistance of the water heater Neutral Circuit. (Reading not to be below 0.66 Mega ohm).

1. ***Isolate power to the water heater by switching off at power point and unplugging appliance 3 pin plug from power point. Confirm with multi-meter across terminal block Active and Neutral, then Active and Earth, then Neutral and Earth that voltage is not present.***
2. Connect megger leads to the Neutral of the water heater wiring and Earth.
3. Operate megger. A reading above 0.66 Mega ohm should be obtained.
4. If a reading below 0.66 Mega ohm is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 1.4 on page 30.

Procedure 2: Insulation resistance of the water heater Active Circuit (reading not to be below 0.66 mega-ohm).

6. Connect megger leads to the Active of the water heater wiring and Earth.
7. Operate megger. A reading above 0.66 Mega ohm should be obtained.
8. If a reading below 0.66 Mega ohm is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 1.4 on page 30.

Procedure 3: To check "Continuity" of the water heater electrical circuit.

9. Set megger to resistance scale or multimeter to x1 resistance scale.
10. Measure between the Active and Neutral terminals on the power supply terminal block located behind the upper electrical access cover. The resistance should be approximately 1.82 kilo ohms for solar preheat models and 51.5 ohms for gas boosted models. If a reading outside these resistance values is obtained, all electrical component parts will need to be individually tested to locate the fault. Refer to Specifications table on page 4 for indicative resistance values of components.
11. Plug appliance 3 pin plug back into power point and switch on power point. ***Note: If continuing with any diagnostic procedures do not perform this step.***

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Electric Boosted Models

Procedure 1: Insulation resistance of the water heater Neutral Circuit. (Reading not to be below 0.66 Mega ohm).

1. ***Isolate power to the water heater by removing fuse(s) or switching off circuit breaker(s). Confirm with multi-meter across terminal block Active A1 and Neutral, then Active A1 and Earth, then Neutral and Earth that voltage is not present.***
2. ***Confirm with multi-meter across terminal block Active A2 and Neutral, then Active A2 and Earth that voltage is not present.***
3. Once satisfied, mark and disconnect the Active and Neutral wires from the water heater terminal block. Note: if two independent power supply circuits are provided, both Active wires must be disconnected; one from terminal A1 and the other from terminal A2.
4. Remove the wiring loop fitted between terminals A1 and A2. Note: this loop will not be fitted if two independent power supply circuits are provided.
5. Connect megger leads to the Neutral of the water heater wiring and Earth.
6. Operate megger. A reading above 0.66 Mega ohm should be obtained.
7. If a reading below 0.66 Mega ohm is indicated, all component parts will need to be individually tested to locate the fault. Refer to Fault Finding Chart 1.4 on page 30.

Procedure 2: Insulation resistance of the water heater Active Circuit (reading not to be below 0.66 mega-ohm).

9. Connect megger leads to the Active A1 terminal of the water heater wiring and Earth.
10. Operate megger. A reading above 0.66 Mega ohm should be obtained.
11. If a reading below 0.66 Mega ohm is indicated, all component parts of the solar circuit will need to be individually tested to locate the fault. Refer to Fault Finding Chart 1.4 on page 30.
12. Connect megger leads to the Active A2 terminal of the water heater wiring and Earth.
13. Operate megger. A reading above 1 Mega ohm should be obtained.
14. If a reading below 1 Mega ohm is indicated, all component parts of the booster circuit will need to be individually tested to locate the fault. Refer to Fault Finding Chart 1.4 on page 30.

Procedure 3: To check "Continuity" of the water heater electrical circuit.

12. Set megger to resistance scale or multimeter to x1 resistance scale.
13. Measure between the Active A1 and Neutral terminals on the power supply terminal block located behind the upper electrical access cover. The resistance should be approximately 1.82 kilo ohms. If a reading outside this resistance value is obtained, all electrical component parts of the solar circuit will need to be individually tested to locate the fault. Refer to Specifications table on page 4 for indicative resistance values of components.
14. Measure between the Active A2 and Neutral terminals on the power supply terminal block located behind the upper electrical access cover. The resistance should be approximately 22 – 26 ohms for 2.4kW element models, 15 – 17 ohms for 3.6kW element models and 11 – 13 ohms for 4.8kW element models. If a reading outside these resistance values is obtained, all booster electrical component parts will need to be individually tested to locate the fault.
15. Reconnect Active cables to A1 & A2 terminals and Neutral cable to N terminal at heater terminal block.
16. Replace wire loop between terminals A1 and A2 if previously removed in step 4.
17. Replace fuse(s) or switch on circuit breaker(s). ***Note: If continuing with any diagnostic procedures do not perform this step.***

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Component Replacement Procedures

Draining the Water Heater (Procedure 1)

Elevated temperatures may be present during the draining process. Wear Personal Protective Equipment to prevent scalds or burns.

Wear Personal Protective Equipment when conducting step 3 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Remove the upper electrical access cover (refer to procedure 5) and ***confirm with a multi-meter between the Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
4. Disconnect the cold water supply pipe.
5. Fit a drain hose to the cold-water connection and run the other end to a drain or safe location.
6. Open the temperature and pressure relief valve to allow air into the system.

Solar Circuit Relief Valve (Procedure 2)

Elevated temperatures may be present during this procedure. Wear Personal Protective Equipment to prevent scalds or burns.

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

Under no circumstances should solar circuit work be performed whilst the solar circuit is hot. It is recommended to conduct any solar circuit procedures in the early morning before maximum solar gain is achieved. Work should also be performed with the solar collectors covered.

It is dangerous to open any part of the closed solar circuit when the system is hot. A serious and significant burn and scald hazard exists. The following procedure is only to be performed when the system is cold.

1. ***Isolate power supply to the water heater*** and remove upper electrical access cover (refer to procedure 5).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Open a hot tap and draw off all hot water from the tank. This will help cool the solar circuit fluid in the heat exchanger.
4. If the pump has been operating allow five minutes for closed circuit fluid to drain back to heat exchanger.
5. Disconnect the drain line from the solar circuit relief valve.
6. Remove the spring clip from the solar circuit relief valve and remove the valve by lifting upwards.

A quantity of hot vapour may discharge from the tank during this process. Wear Personal Protective Equipment to prevent scalds or burns and do not lean over relief valve.

7. Complete reassembly in reverse order of above.

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Temperature and Pressure Relief Valve (Procedure 3)

Never fit a T&PR valve with a rating higher than that indicated on the water heater rating plate. Do not use reconditioned T&PR valves.

1. ***Isolate power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Remove the drain line from the T&PR valve.
4. Unscrew the T&PR valve and remove.

A quantity of hot water will discharge from the tank during this process. Wear Personal Protective Equipment to prevent scalds or burns.

5. Confirm the replacement T&PR valve is the correct rating and refit using thread tape.
6. Refit the drain line.
7. Close the hot tap and restore water supply.
8. Check T&PR valve thread for leaks.
9. Operate the T&PR valve lever to reset relief drain.
10. Purge air from the system through hot taps.
11. Restore the power supply to the water heater.

Pump Access Panel Removal: (Procedure 4)

1. ***Isolate power supply.***
2. Remove two screws from the bottom of the access panel.
3. Remove the access panel by sliding down and then pulling forward, being careful not to damage the solar monitor ribbon cable.

Upper Electrical Access Cover Removal: (Procedure 5)

1. ***Isolate power supply.***
2. Remove two screws from the bottom of the upper electrical access cover.
3. Remove the cover by sliding down and then pulling forward.

Dip Tube (Procedure 6)

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T & PR valve or a hot tap.***
3. Disconnect the hot water line from the outlet of the water heater.

A quantity of hot water will discharge from the outlet during this process. Wear Personal Protective Equipment to prevent scalds or burns.

4. Using a flat blade screwdriver gently split the outer rim at the top and bottom of the dip tube face and prise the dip tube out of the cylinder fitting.
5. Fit the replacement dip tube into the cylinder fitting ensuring the flat lines up with the fitting (dip tube facing up) and gently drive the dip tube into the fitting a short distance.
6. Reconnect the plumbing; this will push the dip tube into the correct location.
7. Restore the water supply and purge air from the system through hot taps.
8. Restore the power supply.

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Anodes (Procedure 7)

Elevated temperatures may be present during anode removal process. Wear Personal Protective Equipment to prevent scalds or burns.

1. ***Isolate the power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater and drain approximately 10 litres of water from the cylinder through the T&PR valve.***
3. Remove the anode cap(s).
4. Using a 27mm tube or socket spanner remove the anode(s).
5. Apply thread seal tape to replacement anode, refit and tighten. Note: It may be necessary to cut the anode to length prior to fitting. Refer to specifications table on page 4 for the correct anode length.
6. Restore water supply and check for leaks.
7. Refit the anode cap(s) and restore power.

Sensor Strip (Procedure 8)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power supply to the water heater*** and remove pump access panel (refer to procedure 4).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the control board power input plug that voltage is not present (refer to diagram on page 15 for plug location).***
3. Unplug sensor strip from control board.
4. Carefully grip the sensor strip and slide the sensor strip out by bending out through pump access cover. Ensure that the sensor strip duct pocket has also not been gripped. ***Note: The fitment between the sensor strip and the pocket is quite firm, do not pull on the wires only as they will break away from the strip.***
5. Carefully insert the replacement sensor strip into the duct pocket and plug into control board. ***Note: When reinserting the replacement sensor strip ensure the plastic backing is facing AWAY from the cylinder.*** The strip must be fully inserted to operate correctly. **Lubricants of any kind must NOT be used.**
6. Replace pump access panel, restore electricity supply and check appliance operation.

Control Board (Procedure 9)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power supply to the water heater*** and remove pump access panel (refer to procedure 4).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the control board power input plug that voltage is not present (refer to diagram on page 15 for plug location).***
3. Unplug sensor strip, cold sensor, hot sensor, remote solar monitor, pump 1, pump 2 (if fitted) and power supply plugs from control board.
4. Disconnect pump 1 wire from N/O terminal of pump relay.
5. Remove retaining screw from control board backing plate and remove control board.
6. Complete reassembly in reverse order of above.
7. Restore electricity supply and check appliance operation.

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Pump Relay (Procedure 10)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power supply to the water heater*** and remove pump access panel (refer to procedure 4).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the control board power input plug that voltage is not present (refer to diagram on page 15 for plug location).***
3. Unplug pump relay plug from control board.
4. Disconnect pump 1 wire from N/O terminal of pump relay.
5. Remove pump relay retaining screw and remove pump relay.
6. Complete reassembly in reverse order of above.
7. Restore electricity supply and check appliance operation.

Remote Solar Monitor (Procedure 11)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate the power supply to the water heater*** and remove pump access panel (refer to procedure 4).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the control board power input plug that voltage is not present (refer to diagram on page 15 for plug location).***
3. Unplug remote solar monitor plug from control board.
4. Remove existing remote solar monitor by peeling away from pump access panel and then withdrawing ribbon cable through the slot in the pump access panel.
5. Remove adhesive backing from replacement solar monitor and complete reassembly in reverse order of above.
6. Replace pump access panel, restore electricity supply and check appliance operation.

Cold Sensor (Procedure 12)

Ensure any escaping solar circuit fluid is contained and does not enter any part of a rainwater tank system as entry will render the water undrinkable.

1. Remove the solar circuit relief valve by following steps 1 – 6 in procedure 2. This will relieve the solar circuit pressure. **Note:** ***ensure all warnings in procedure 2 are observed and adhered to.***
2. Unplug cold sensor plug from control board.
3. Turn heat exchanger isolation valve off by rotating clockwise 90º.
4. Remove the spring clip retaining the cold sensor in the pipe work ‘tee’, and remove the locating washer and cold sensor. Note: a small amount of solar circuit fluid will drain from the cold sensor aperture during this procedure; have the replacement sensor ready to quickly install so fluid loss is minimised.
5. Fit the replacement sensor into the “tee” and secure with the spring clip. Ensure the clip retains the locating washer.
6. Complete reassembly in reverse order of above.
7. Restore electricity supply and check appliance operation.

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Hot Sensor (Procedure 13)

1. ***Isolate power supply to the water heater.***
2. Remove the spring clip retaining the hot sensor in the collector connector and remove the locating washer and hot sensor.
3. Fit the replacement sensor into the connector and secure with the spring clip. Ensure the clip retains the locating washer.
4. Cut the wiring to the existing sensor and connect to the replacement sensor. Ideally this connection should be made in the roof space. If the connection is to be made on the roof, ensure the connection is water and UV proof.
5. Restore electricity supply and check appliance operation.

Pump (Procedure 14)

Ensure any escaping solar circuit fluid is contained and does not enter any part of a rainwater tank system as entry will render the water undrinkable.

1. Remove the solar circuit relief valve by following steps 1 – 6 in procedure 2. This will relieve the solar circuit pressure. **Note:** ***ensure all warnings in procedure 2 are observed and adhered to.***
2. Turn heat exchanger isolation valve off by rotating clockwise 90º.
3. Unplug pump plug from control board.
4. Disconnect pump wire from N/O terminal of pump relay.
5. Undo pump unions and remove pump. Note: a small amount of solar circuit fluid will drain from the pump pipe work during this procedure. This fluid should be caught in a clean container and added back into the system via the solar circuit relief valve opening.
8. Complete reassembly in reverse order of above.
6. Restore electricity supply, check appliance operation and check for any leaks.

Heat Exchanger Drain Valve (Procedure 15)

Ensure any escaping solar circuit fluid is contained and does not enter any part of a rainwater tank system as entry will render the water undrinkable.

1. Remove the solar circuit relief valve by following steps 1 – 6 in procedure 2. This will relieve the solar circuit pressure. **Note:** ***ensure all warnings in procedure 2 are observed and adhered to.***
2. Attach one end of a ½" flexible hose to heat exchanger drain valve and insert the other end into a clean container.
3. Open heat exchanger drain valve by rotating 90º in an anti clockwise direction. Solar circuit fluid will now drain into the container. Note: approximately 16 litres of fluid will drain out of the heat exchanger. When all fluid has been drained remove ½" hose.
4. Unscrew heat exchanger drain valve from pipe work.
5. Unscrew ½" nipple from drain valve and screw into replacement drain valve using thread tape.
6. Screw replacement drain valve into heat exchanger pipe work using thread tape and ensure drain valve is in closed position.
7. Pour solar circuit fluid into solar relief valve opening and complete solar circuit relief valve reassembly in reverse order of procedure 2 steps 1 – 6.
8. Restore power and water supplies and check for leaks.
9. If fluid was lost, recommission appliance to check solar circuit fluid level (refer to 'Commissioning Procedure' on page 57).

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Pump Isolation Valve (Procedure 16)

Ensure any escaping solar circuit fluid is contained and does not enter any part of a rainwater tank system as entry will render the water undrinkable.

1. Remove the solar circuit relief valve by following steps 1 – 6 in procedure 2. This will relieve the solar circuit pressure. ***Note: ensure all warnings in procedure 2 are observed and adhered to.***
2. Attach one end of a ½" flexible hose to heat exchanger drain valve and insert the other end into a clean container.
3. Open heat exchanger drain valve by rotating 90º in an anti clockwise direction. Solar circuit fluid will now drain into the container. Note: approximately 16 litres of fluid will drain out of the heat exchanger. When all fluid has been drained close drain valve by rotating 90º in a clockwise direction and remove ½" hose.
4. Unscrew pump isolation valve nut and olive and pull out pump pipe work from valve. Note: A small amount of solar circuit fluid will drain from heat exchanger pipe work.
5. Unscrew and remove pump isolation valve from heat exchanger pipe work.
6. Unscrew and remove male upper half of nut and olive connection from isolation valve and screw into replacement isolation valve using thread tape.
7. Screw replacement isolation valve into heat exchanger pipe work and insert pump pipe work into isolation valve and tighten nut and olive.
10. Open pump isolation valve (if closed) and pour solar circuit fluid into solar relief valve opening and complete solar circuit relief valve reassembly in reverse order of procedure 2 steps 1 – 6.
11. Restore power and water supplies and check for leaks.
12. If fluid was lost, recommission appliance to check solar circuit fluid level (refer to 'Commissioning Procedure' in 'Owners Guide & Installation Instructions').

Tempering Valve – Gas Boosted Models Only (Procedure 17)

A quantity of hot water may discharge from gas booster & hot pipe during this procedure. Wear Personal Protective Equipment to prevent scalds or burns.

1. ***Isolate power and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Unscrew the tempered water pipe work union at the tempering valve elbow.
4. Unscrew the tempering valve hot and cold water unions and remove tempering valve.
5. Unscrew and remove elbow from tempering valve.
6. Complete reassembly in reverse order of above.

Removing or Replacing an J or KF Series Solar Collector (Procedure 18)

1. Remove the solar circuit relief valve by following steps 1 – 6 in procedure 2. This will relieve the solar circuit pressure. **Note:** ***ensure all warnings in procedure 2 are observed and adhered to.***
2. Disconnect the hot and cold pipes at the collector(s) by unscrewing pipe unions at collector(s) and pulling pipe work from collector(s).
3. Unscrew the collector inter-connector unions (if more than one collector) at the top and bottom of the collectors. Do not stand on the collectors.
4. Remove the clamp screws retaining the collector to the angle bracket clamps, disconnect the retaining strap at the top of the collector, slide the collector(s) out and remove to ground level.
5. Complete collector and solar circuit relief valve assembly in reverse order of above.
6. Restore power and water supplies, check operation and check for leaks.

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Gas Booster – Gas Boosted Models Only (Procedure 19)

A quantity of hot water may discharge from the gas booster and tank and gas booster hot pipes during this procedure. Wear Personal Protective Equipment to prevent scalds or burns.

Wear Personal Protective Equipment when conducting step 3 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power, gas and water supplies to the water heater.***
2. ***Relieve pressure from the water heater through the T&PR valve or a hot tap.***
3. Remove the upper electrical access cover (refer to procedure 5) and ***confirm with a multi-meter between the Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
4. Disconnect the gas booster wiring at the terminal block.
5. Disconnect the gas booster gas supply line from the gas inlet connection of gas booster.
6. Disconnect the gas booster cold water supply pipe from the cold-water inlet connection of gas booster by unscrewing brass union.
7. Unscrew the gas booster water drain plug and relief valve and drain the gas booster.
8. Disconnect the gas booster hot water supply pipe from the gas booster hot water outlet connection by unscrewing brass union.
9. Unscrew single screw retaining gas booster lower bracket to tank gas booster support bracket.
10. To remove gas booster, lift gas booster up from tank approximately 50mm to unhinge gas booster upper bracket and pull away from tank.
11. Remove upper half of brass unions removed in steps 6 & 8 from gas booster and install in replacement gas booster using thread tape.
12. Unscrew and remove two screws on replacement gas booster upper bracket, rotate bracket 180º and refix bracket to gas booster utilising the two screws removed previously.
13. Complete reassembly by reversing steps 1 – 10 above.
14. When complete test gas booster operation and check for leaks.

Mechanical Thermostat – Electric Boosted Models Only (Procedure 20)

Wear Personal Protective Equipment when conducting step 2 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Isolate power to the water heater*** and remove the upper electrical access cover (refer to procedure 5).
2. ***Confirm with a multi-meter between Active and Neutral, then Active and Earth, then Neutral and Earth terminals of the terminal block that voltage is not present.***
3. Disconnect the wiring to the thermostat.
4. Slide the thermostat out from under the retaining clamp.
5. Remove any scale from the cylinder surface.
6. Fit the replacement thermostat under the clamp.
7. Reconnect the wiring as per the circuit wiring diagram on page 6 or 7 depending upon thermostat type (EWT or ST).
8. Conduct an electrical insulation test. Refer to page 42.
9. Refit the access cover and restore the power supply.

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Heating Unit – Electric Boosted Models Only (Procedure 21)

Wear Personal Protective Equipment when conducting step 1 of this procedure to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

1. ***Drain the water heater. Refer to procedure 1.***
2. Remove the upper electrical access cover (refer to procedure 5) and disconnect the wiring from the terminal block. Disconnect the wiring to the heating unit from the thermostat. Unclip the terminal block from the jacket and remove thermostat and terminal block.
3. Remove the two screws retaining the thermostat clamp.
4. Loosen the two lower screws slightly. When water is below the heating unit level, refit the cold water supply pipe.
5. Remove the two lower screws and withdraw the heating unit carefully making sure the loop does not catch and open up inside the cylinder.
6. Clean around the cylinder fitting, fit gasket to replacement heating unit and insert into water heater. Note: Ensure the element is installed in the same orientation.
7. Replace screws and thermostat clamp, and then tighten.
8. Close T&PR valve, and open all hot taps. Restore the cold water supply and purge air through hot taps, close each hot tap as water runs freely.
9. Check heating unit for leaks.
10. Refit thermostat and terminal block and reconnect the wiring as per the circuit wiring diagram on page 6 or 7 depending upon thermostat type (EWT or ST).
11. Refit the upper electrical access cover.
12. Restore power supply to the water heater.

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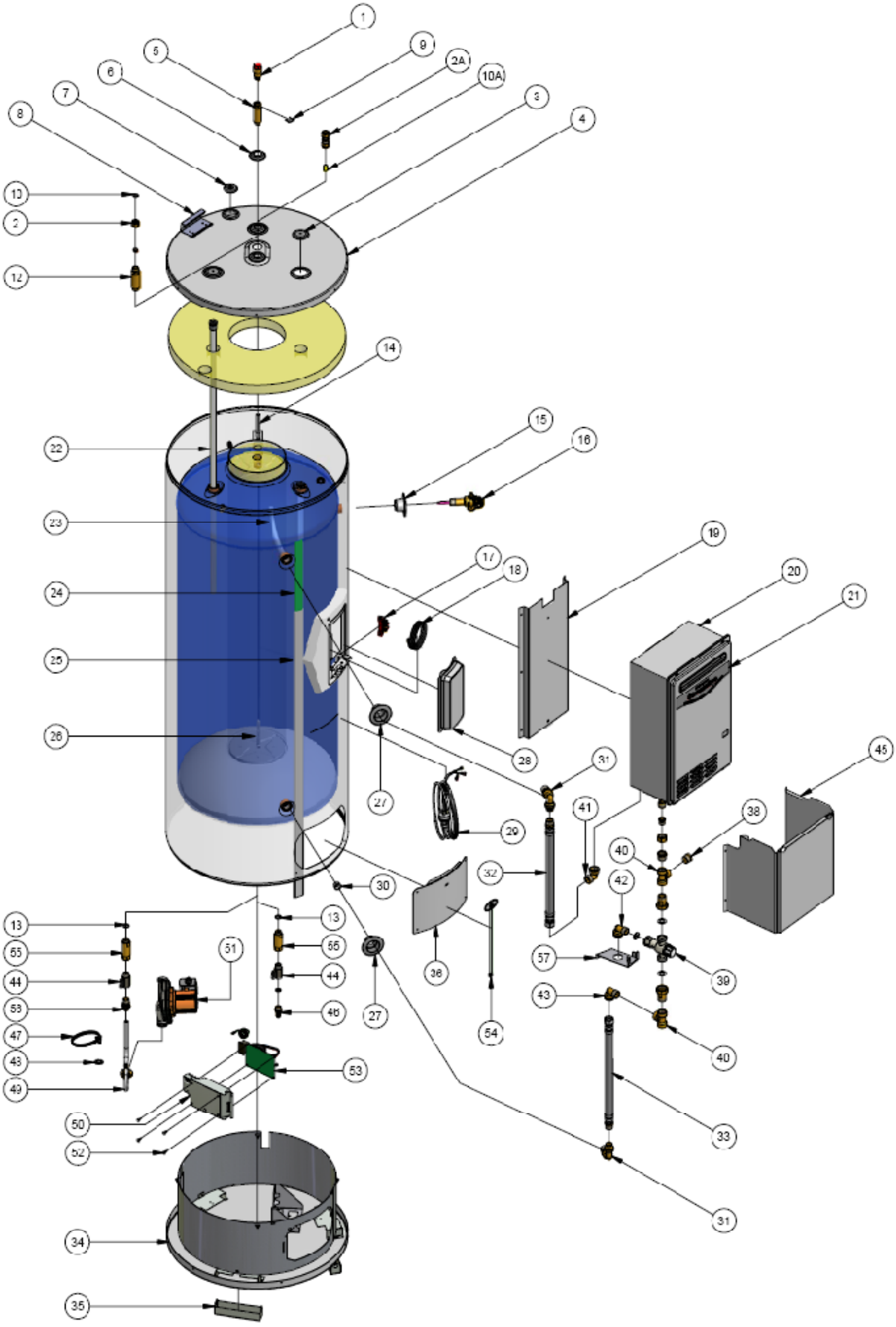
Exploded View 1 – Solar Preheat & Gas Boosted Models



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Replacement Parts List (Exploded View 1)

Item	Description	Solar Preheat	Gas Boosted	Item	Description	Solar Preheat	Gas Boosted
1	Closed Circuit Relief Valve 200kPa	088077	088077	30	Fitting Liner ¾”	221001	221001
2	Union ½”C x ½”M (pre 19/9/06)	088063	088063	31	31a - Fitting Hot/Cold Connection ¾”C X ¾”M	N/A	NLA
2a	Compression Nut 1/2”	088119	088119		31b – Elbow Brass ¾”M X 3/4” Screw	N/A	087050
3	Anode Cover	221720-1	221720-1	32	32a – Hot Pipe – Insul Copper	N/A	NLA
4	Jacket Top	108370	108370		32b – Hot Pipe – Insul Flexible 440mm X ¾”	N/A	088137
5	Extension Fitting – Relief Valve	088095	088095	33	33a – Cold Pipe – Insul Copper	N/A	NLA
6	Pipe Seal – Solar Conn/Solar Relief valve	221229	221229		33b – Cold Pipe – Insul Flexible 450mm X ¾”	N/A	088138
7	Foam Cover	221735	221735	34	Jacket Bottom	108377	108377
8	Hand Grip	108243	108243	35	Foot	108107	108107
9	Spring Clip - Relief Valve	088100	088100	36	Cover – Pump Access	104634	104634
10	Rubber Disc – Transport item only	087035	087035	37	Union	N/A	088110
10a	Kelvindale Plug – Transport item only	221754	221754	38	Brass Plug	N/A	088111
11	Compression Olive	088027	088027	39	Tempering Valve	N/A	224007
12	Extension Fitting – Solar Hot Connection	088118	088118	40	Tee Brass ¾” Screw	N/A	088073
13	O-ring	087034	087034	41	41a – Union ¾”C x ¾”F	N/A	NLA
14	Hot Pipe – Pump to Outlet	N/A	N/A		41b – Elbow Brass ¾”M X ¾”F Screw	N/A	088117
15	Pipe Seal – T&PR Valve	221420	221420	42	Elbow Brass ¾”M x ¾” F Screw	N/A	088117
16	T&PR Valve ½” x 1000kPa	220641	220641	43	43a – Union ¾”C x ¾”M	N/A	NLA
17	Terminal Block	051520	051520		43b – Elbow Brass ¾”M X ¾”F Screw	N/A	088117
18	Hot sensor lead – PCB to Elec Enclosure	056007	056007	44	Ball Valve	088075	088075
19	Mounting Panel	108278	108278	45	Pipe Cover	N/A	103617
20	Gas Booster - Natural	N/A	271026NF/M	46	Hose Tail	088115	088115
	Gas Booster – Propane	N/A	271026PF/M	47	Cold Sensor	056006	056006
21	Name Strip	120712	120715	48	Washer	087033	087033
22	Anode – Black	221914	221914	49	Cold Pipe – Pump to Heat Exchanger	088080	088080
	Anode – Blue	221924	221924	50	Bracket - Controller	108277	108277
	Anode - Green	222024	222024	51	Pump - Salmson HXE63/15P	088081	088081
23	Dip Tube	225601	225601	52	PCB Support Post	052120	052120
24	Sensor Strip	053060	053060	53	Controller PCB	053050	053050
25	Conduit	N/A	N/A	54	Solar Monitor	052133	052133
26	Strainer	220520	220520	55	Brass Extension Fitting	088092	088092
27	Pipe Seal – Inlet/Outlet	221418	221418	56	Union ½”C X ½”M contite	088124	088124
28	Front Cover solar preheat models	103614	103615	57	Bracket – Plumbing Support	N/A	140117
29	Power Lead	053054	053054				

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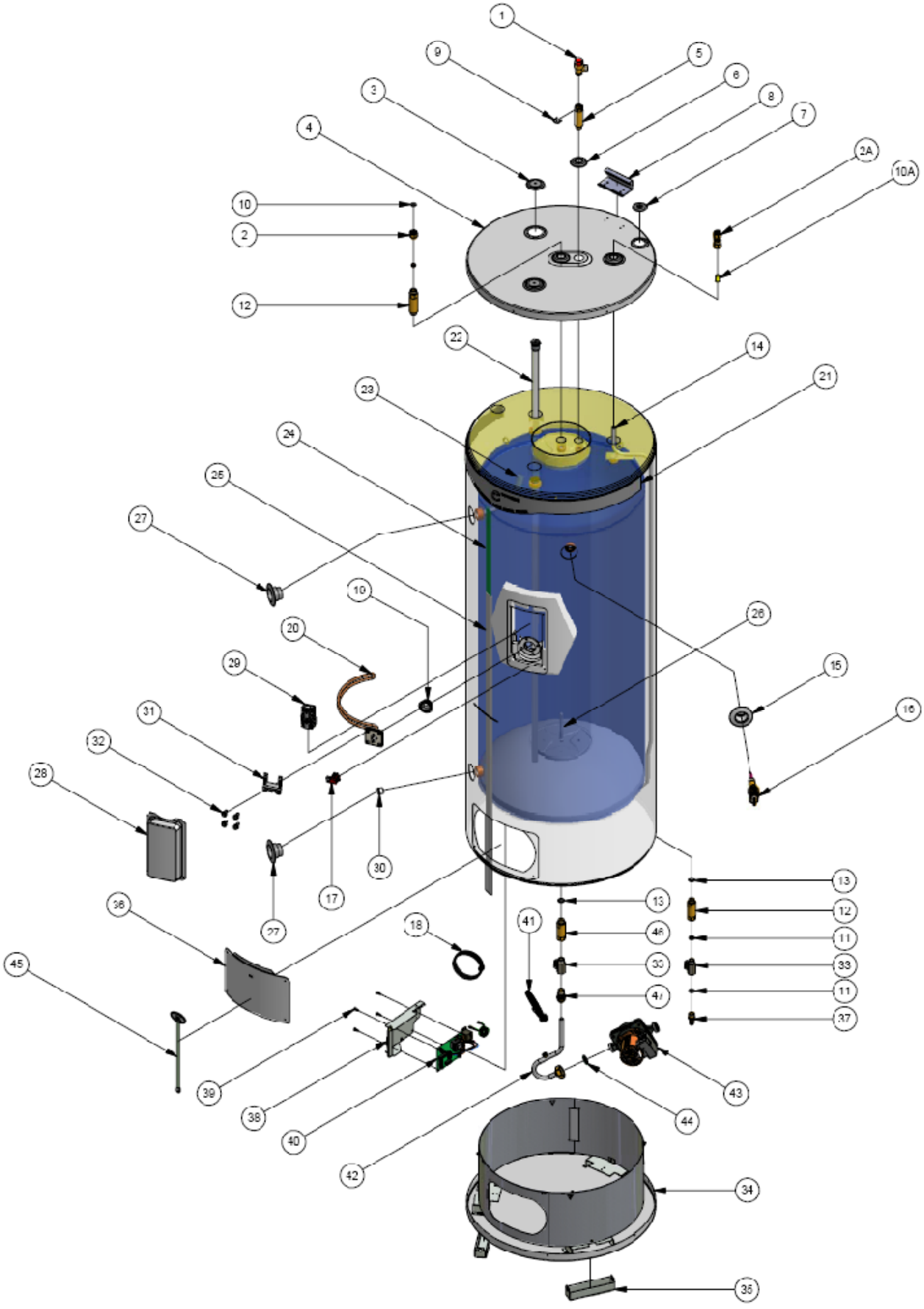
Exploded View 2 – Electric Boosted Models



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Replacement Parts List (Exploded View 2)

Item	Description	Electric Boosted
1	Closed Circuit Relief Valve 200kPa	088077
2	Union ½"C x ½"M (pre 19/9/06)	088063
2a	Compression Nut ½"	088119
3	Anode Cover	221720-1
4	Jacket Top	108370
5	Extension Fitting – Relief Valve	088095
6	Pipe Seal – Solar Connections	221229
7	Foam Cover	221735
8	Hand Grip	108243
9	Spring Clip - Relief Valve	088100
10	Rubber Disc – Transport item only	087035
10a	Kelvindale Plug – Transport item only	221754
11	Compression Olive	088027
12	Extension Fitting – Solar Hot Connection	088118
13	O-ring	087034
14	Hot Pipe – Pump to Outlet	N/A
15	Pipe Seal – T&PR Valve	221420
16	T&PR Valve ½" x 1000kPa	220641
17	Terminal Block – 3 Way	051507
18	Hot sensor lead – PCB to Electrical Enclosure	056007
19	Heating Unit Gasket	050704
20	Heating Unit 2.4kW	050212
	Heating Unit 3.6kW	050210
	Heating Unit 4.8kW	050209
21	Name Band	120713
22	Anode – Black	221914
	Anode – Blue	221924
	Anode - Green	222024
23	Dip Tube	225601
24	Sensor Strip	053060
25	Conduit	N/A
26	Strainer	220520
27	Pipe Seal – Inlet/Outlet	221418
28	Front Cover	103616
29	Thermostat	052012
30	Fitting Liner ¾"	221001
31	Thermostat Clamp	120501
32	Element Bolts	051404
33	Ball Valve	088075
34	Jacket Bottom	108377
35	Foot	108107
36	Cover – Pump Access	104634
37	Hose Tail	088115
38	Bracket - Controller	108277
39	PCB Support Post	052120
40	Controller PCB	053050
41	Cold Sensor	056006
42	Cold Pipe – Pump to Heat Exchanger	088080
43	Pump - Salmson HXE63/15P	088081
44	Washer	087033
45	Solar Monitor	052133
46	Brass Extension Fitting	088092
47	Union ½"C X ½"M contite	088124

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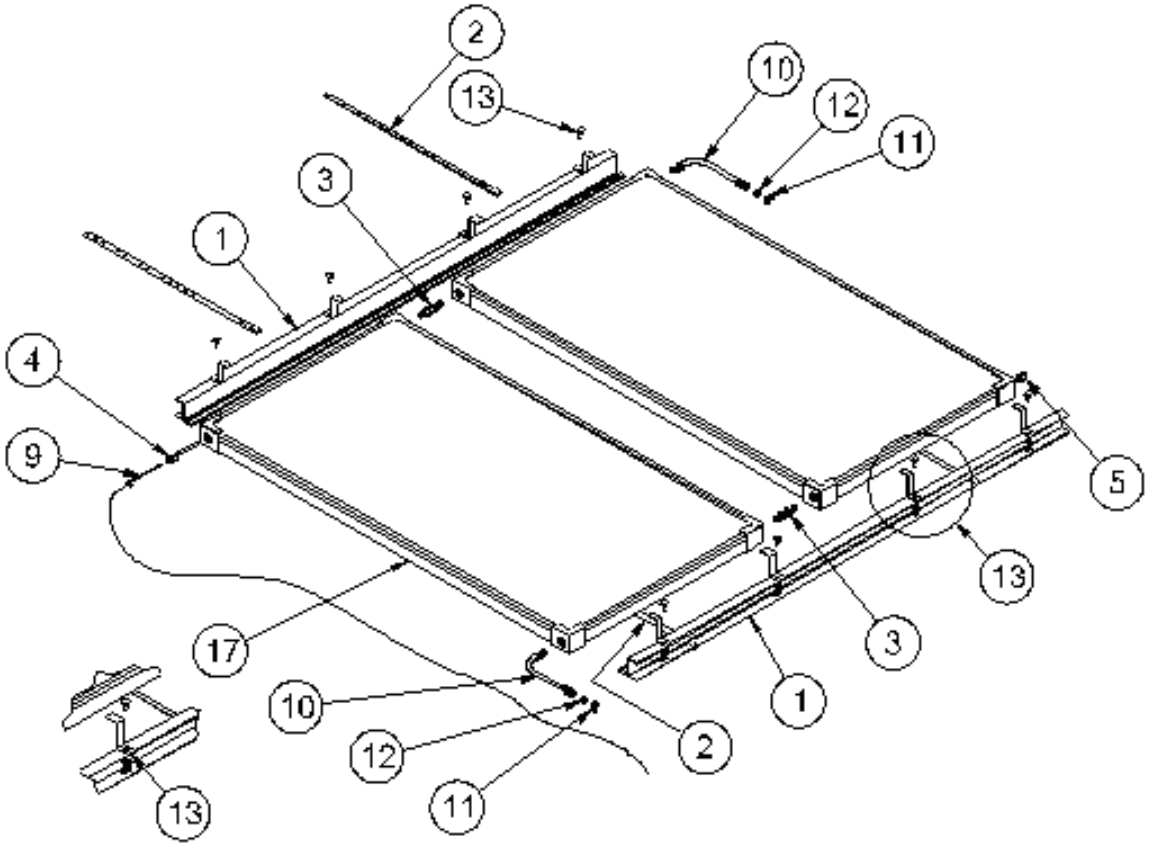
Exploded View Collectors



Replacement Parts List (Collectors)

Item	Description	Part Number
1	Rail – 1 Collector	331847
	Rail – 2 Collectors	331846
	Rail – Extension (3 Panels)	331851
2	Strap	330847
3	Union	337121
4	Sensor Housing	340440
5	End Plug	337135
9	Hot Sensor	346080
10	Connector	340450
11	Compression Nut	331655
12	Olive	331656
13	Clamp	331928
14	Cable Tie	348071
17	J Collector	13103050
	Kf Collector	13103060
NI	Bolt	330350
	Washer	330354
	Nut	330806

Note: Collector glass is not replaceable.

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Solar Circuit

It is necessary to commission and check the operation of the solar circuit upon initial installation and whenever closed circuit fluid is lost due to leakage or when performing a closed circuit component replacement procedure i.e collector replacement. The commissioning procedure includes:

- Checking the circulation of closed circuit fluid through the solar circuit.
- Checking the drain back function of the solar circuit.
- Pressure testing the solar circuit to ensure there are no leaks.
- Checking the level of the closed circuit fluid and adjusting if required.

The water heater is supplied charged with closed circuit fluid. The level of the closed circuit fluid only needs to be checked if:

- A third solar collector is installed.
- There is a significant leak in the solar pipe work and closed circuit fluid has been discharged.
- The maximum recommended solar pipe length is exceeded.
- A second solar pump is installed if the maximum height from the base of the solar storage tank to the top of the solar collectors exceeds 9 m (refer to Maximum Total Pipe Lengths table on page 12).

Additional Equipment

Additional equipment will be required for the commissioning and checking of the solar circuit. This includes checking the closed circuit fluid level and conducting a drain back test. The following equipment is required:

- A 1500 mm long x 12 mm (½") diameter clear hose (closed circuit fluid level hose).
- One (1) ½" hose clamp.
- A suitable plug for one end of the hose.
- Suitable tape to affix the hose to the side of the solar storage tank.
- A torch to illuminate the working area under the heat exchanger and storage tank cylinder.
- A non-permanent marker.

Closed Circuit Fluid

The water heater is supplied charged with closed circuit fluid and it is not necessary to add further closed circuit fluid to the system. If the closed circuit fluid has been completely drained or discharged from the solar circuit and needs to be replaced, then the amount to be added is:

- 4.5 litres of concentrate, mixed with
- 11.5 litres of water.

It is necessary to undertake the solar circuit commissioning procedure if the closed circuit fluid has been replaced.

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The closed circuit fluid contains food grade additives (rust inhibitor, anti-freeze agent, colour) and is harmless to the environment. However, it is good practice to recover any excess closed circuit fluid and remove from site for appropriate disposal.

Warning: Although non-toxic, the following first aid advice and procedures should be followed if the closed circuit fluid concentrate comes into human contact or is spilt:

- Swallowed - give milk or water and seek medical attention.
- Eyes - wash with running water.
- Skin - remove contaminated clothing and wash skin with water and soap.
- Inhaled - seek fresh air, rest and keep warm.
- Spilt - immediately remove contaminated clothing, stop leak source, absorb with a dry agent and eliminate any ignition sources nearby.

Pre-commissioning Warnings

It is recommended to conduct the solar circuit commissioning procedure with the solar collectors covered, otherwise during the commissioning and checking procedure of the solar circuit, the closed circuit fluid may experience solar gain as it passes through the solar collectors. This will increase both the temperature and pressure of the closed circuit fluid and vapour inside of the solar circuit.

The electrical supply must be switched off before the solar circuit is opened either at the solar circuit relief valve or at the compression nut on either of the solar hot or solar cold pipes at the top of the solar storage tank.

If it is necessary to open the solar circuit at the solar circuit relief valve or at the compression nut on either of the solar hot or solar cold pipes at the top of the solar storage tank, then care must be taken so as not to be scalded by either the closed circuit fluid or the vapour escaping from the solar circuit.

Pre-Commissioning Notes

1. Before commencing the solar circuit commissioning procedure, check the solar cold and solar hot pipe work to ensure:

   - There is a continuous fall from the solar collectors to the solar storage tank of a minimum 5° (1 in 10 grade).
   - The maximum recommended pipe length is not exceeded.
   - The maximum height from the base of the solar storage tank to the solar collector is not exceeded.

   Rectify the solar pipe work if there is either insufficient fall or not a continuous fall of at least 5° from the solar collectors to the solar storage tank or if either of the maximum pipe length or maximum height of the system has been exceeded, before commencing the solar circuit commissioning procedure (refer to Maximum Total Pipe Lengths table on page 12).

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2. The solar collectors will gain a high level of heat during periods of solar radiation. If the solar pump is activated during a period of high solar radiation and the solar collectors have not been covered, the initial flow of closed circuit fluid will absorb this heat and a rumbling sound may be heard. This is normal and the solar circuit will achieve a stable operating condition once full flow through the solar circuit is established.
3. The solar pump is set on speed setting 3. This speed setting must not be adjusted. The solar control unit automatically controls and adjusts the speed of the pump to maximise solar contribution. Manual adjustment of the speed dial setting may result in the system not operating correctly or efficiently.

Commissioning the Solar Circuit

To commission and check the solar circuit:

1. Switch off the electrical supply at the isolating switch to the solar storage tank.
   If the pump has been operating, wait five minutes to allow the drain back of the closed circuit fluid in the solar circuit.
2. Cover the solar collectors with an opaque material to prevent solar gain during the commissioning process.
3. Remove the lower and upper front covers from the solar storage tank.

   The solar monitor located on the pump access cover is connected to the solar control module by a ribbon cable. The ribbon cable has sufficient length to enable the removal of the pump access cover and for it to be set to one side of the opening without disconnecting the ribbon cable from the solar control module.

   The ribbon cable can be disconnected from the solar control module if it is necessary to remove the pump access cover completely from the work area in front of the solar storage tank.

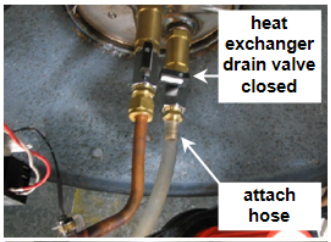
4. Ensure the isolation valve in the pipe work between the outlet of the heat exchanger and the solar pump, located behind the pump access cover of the solar storage tank, is fully open.

Attach Closed Circuit Fluid Level Hose

5. Attach the clear hose to the solar circuit.

   To attach the hose:

   - Ensure the heat exchanger drain valve is closed. The heat exchanger drain valve is located adjacent to the solar pump, behind the pump access cover of the solar storage tank.
   - Attach one end of the hose to the hose tail connection. It may be necessary to secure the hose with a hose clamp.
   - Plug the free end of the hose.
   - Affix the hose securely in a vertical orientation to the front of the solar storage tank using tape, adjacent to the text, “MINIMUM FLUID LEVEL WITH PUMP OPERATING”.



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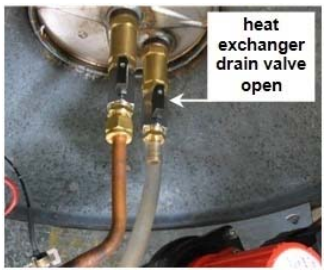
6. Disconnect the drain line from the solar circuit relief valve at the top of the solar storage tank. Remove the spring clip from the solar circuit relief valve and remove the valve.

Warning: The solar circuit may be under pressure. Take care when removing the solar circuit relief valve, as a sudden discharge of pressurised hot vapour may be experienced. This discharge will create a sharp sound of vapour being released.

7. Open the heat exchanger drain valve and remove the plug from the end of the hose. The closed circuit fluid will flood the hose to the static level of the closed circuit fluid inside of the heat exchanger.



8. Mark the static level of the closed circuit fluid on the side of the solar storage tank with a non permanent marker.

Solar Circuit Circulation

9. Disconnect the hot sensor lead from the connecting plug located on the tab in the upper front cover opening.

   It is important, at the end of this procedure when the commissioning and checking of the solar circuit is complete, to reconnect the hot sensor lead, otherwise when the electrical supply is switched on, the solar pump will deactivate after one hour and the solar control unit will then enter a fault mode and no solar gain will be achieved.

10. Switch on the electrical supply at the isolating switch to the solar storage tank.

Warning: Take care not to enter the area inside the solar storage tank behind the access covers whilst the power is on as the electrical circuit will be live.

The red LED on the solar monitor label will start flashing.

The pump will activate and commence pumping closed circuit fluid around the solar circuit.

The level of the closed circuit fluid in the clear hose will slowly drop to the dynamic operating level.

Allow the pump to operate for three (3) minutes (one and two collector systems) or for five (5) minutes (3 collector system) to allow the solar circuit to fill with closed circuit fluid and stabilise.

Note: The solar pump will operate for one hour with the hot sensor lead disconnected, before automatically turning itself off (refer to step 13).

11. Check the closed circuit fluid is circulating around the solar circuit.

    To check circulation:

- Listen for the trickling sound of the closed circuit fluid returning into the heat exchanger by placing your ear against the side toward the top of the solar storage tank. If the fluid is circulating around the solar circuit, a trickling sound will be heard as the fluid returns back into the heat exchanger.

  If no trickling sound is heard, check:

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- The hot sensor lead is disconnected at the solar storage tank.

  If connected, disconnect the hot sensor lead at the solar storage tank (refer to step 9).

- The isolation valve in the pipe work between the outlet of the heat exchanger and the solar pump, located behind the pump access cover of the solar storage tank, is fully open.

Warning: Switch off the electrical supply at the isolating switch to the solar storage tank before entering the area inside the solar storage tank behind the pump access cover.

  If closed, open the isolation valve on the outlet of the heat exchanger (refer to step 4).

- There is no leakage from the solar circuit. It is important to check all of the solar circuit pipe work, including in the roof space and on the roof.

  If leaking, rectify any leaks in the solar circuit.

- The height from the base of the storage tank to the top of the collectors has not exceeded the maximum allowable height.

- The length of solar cold and solar hot pipe has not exceeded the maximum recommended pipe length.

  If the maximum allowable height or the maximum recommended pipe length has been exceeded, it may be necessary to relocate the solar collectors to either a lower level or closer to the solar storage tank, or install a second solar pump, or relocate the solar storage tank closer to the solar collectors (refer to Maximum Total Pipe Lengths table on page 12).

12. Mark the dynamic level of the closed circuit fluid in the hose on the side of the solar storage tank with a non permanent marker when satisfied the solar circuit circulation is operating satisfactorily.

13. If the procedure to check the solar circuit circulation is not complete before the pump has automatically turned off, then:
    - Switch off the electrical supply at the isolating switch to the solar storage tank.
    - Wait one (1) minute for the operating system to reset to its commissioning sequence, otherwise the pump may not operate when the power supply is switched on.
    - Recommence this procedure from step 10.

Drain Back Function

14. Switch off the electrical supply at the isolating switch to the solar storage tank.

    The red LED on the solar monitor label will stop flashing.

    The pump will deactivate.

    The closed circuit fluid will drain back down to the heat exchanger and the level of the closed circuit fluid in the clear hose will rise.

    Wait five (5) minutes to allow the drain back of the closed circuit fluid in the solar circuit.

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15. Note the level of the closed circuit fluid in the fluid level hose.

    The closed circuit fluid should drain back to the original static level.

    If the closed circuit fluid does not drain back completely to this level, then check:

    - There is a continuous fall of at least 5° (1 in 10 grade) in the solar pipe work from the solar collectors to the solar storage tank.
    - The solar collectors have an inclination of not less than 10°.
    - The connectors on the inlet and outlet of the collectors are orientated downwards to ensure complete drain back of the closed circuit fluid from the solar collectors.

    If necessary, rectify the:

    - Solar pipe work if there is either insufficient fall or not a continuous fall in the pipe work.
    - Solar collector inclination if it is less than 10°.
    - Orientation of the connectors downwards if they are not orientated correctly.

    Recheck the drain back function of the solar circuit by repeating step 8 and recommencing this procedure from step.

Closed Circuit Fluid Level

Note: Refer to diagrams on page 63 in conjunction with the following text.

16. Measure the distance from the text marking “MINIMUM FLUID LEVEL WITH PUMP OPERATING” to the closed circuit fluid dynamic level marked on the side of the solar storage tank during step 12.

    The correct closed circuit fluid dynamic level for efficient operation of the system when the pump is operating is between the “MINIMUM FLUID LEVEL WITH PUMP OPERATING” text marking on the side of the solar storage tank and 150 mm above this mark.

    - If the closed circuit fluid dynamic level marked on the side of the solar storage tank during step 12 is greater than 150 mm above the text marking, it will be necessary to DRAIN closed circuit fluid from the heat exchanger.
    - If the closed circuit fluid dynamic level is below the text marking, it will be necessary to ADD water to the heat exchanger to top up the level of closed circuit fluid.

      There is sufficient closed circuit fluid concentrate in the solar circuit heat exchanger such that only water needs to be added to the system if it is required to top up the level of closed circuit fluid.

    Note: The dynamic level of the closed circuit fluid, upon the completion of commissioning, must not be less than the “MINIMUM FLUID LEVEL WITH PUMP OPERATING” text marking on the side of the solar storage tank or greater than 150 mm above this mark.

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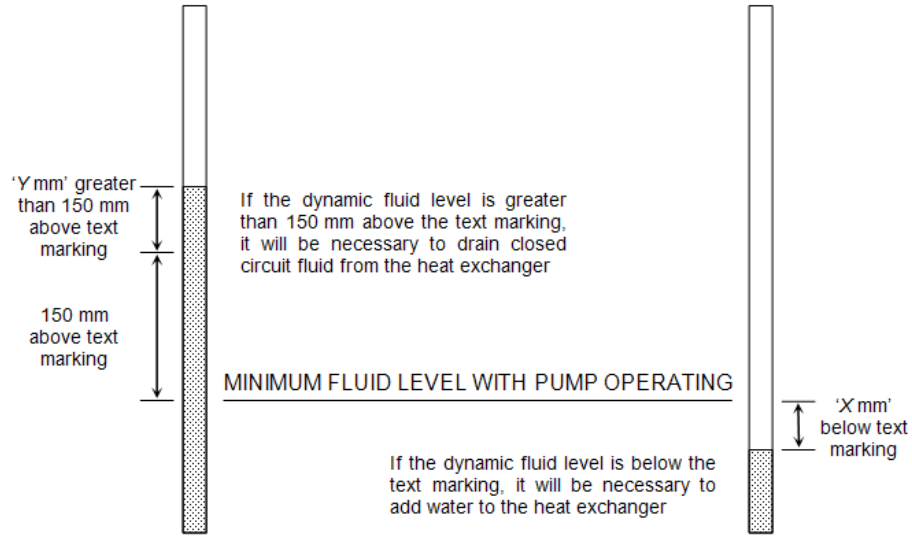

'Y mm' greater than 150 mm above text marking
150 mm above text marking
If the dynamic fluid level is greater than 150 mm above the text marking, it will be necessary to drain closed circuit fluid from the heat exchanger
MINIMUM FLUID LEVEL WITH PUMP OPERATING
'X mm' below text marking
If the dynamic fluid level is below the text marking, it will be necessary to add water to the heat exchanger

17. Determine the correct amount of water to be added to or closed circuit fluid to be drained from the heat exchanger if the dynamic level is either below the text marking "MINIMUM FLUID LEVEL WITH PUMP OPERATING" or more than 150 mm above this mark.

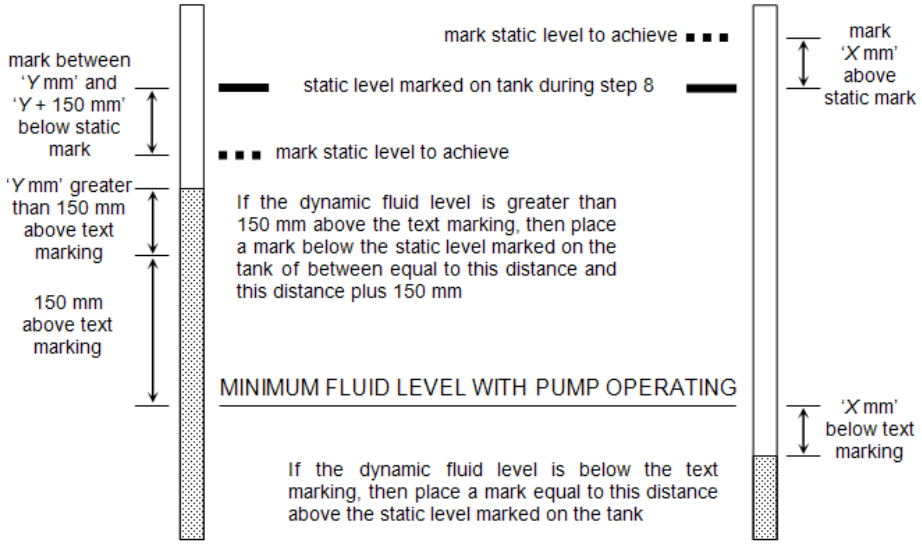
    Each 100 mm of fluid level height is equivalent to three (3) litres of closed circuit fluid.

20 mm	0.6 litres	80 mm	2.4 litres	140 mm	4.2 litres
40 mm	1.2 litres	100 mm	3.0 litres	160 mm	4.8 litres
60 mm	1.8 litres	120 mm	3.6 litres	180 mm	5.4 litres

- Mark the required closed circuit fluid level to be obtained on the side of the solar storage tank with a non permanent marker beside the clear hose, in relation to the static level marked on the side of the solar storage tank during step 8.

  e.g.: If the dynamic level is 30 mm below the text marking, then place a mark 30 mm above the static level marked on the side of the solar storage tank in step 8. It would be necessary to add one litre of water to the heat exchanger.

  e.g.: If the dynamic level is 180 mm above the text marking, then place a mark at least 30 mm, but no more than 180 mm, below the static level marked on the side of the solar storage tank. It would be necessary to drain between one litre and five litres of closed circuit fluid from the heat exchanger.


mark between 'Y mm' and 'Y + 150 mm' below static mark
'Y mm' greater than 150 mm above text marking
150 mm above text marking
mark static level to achieve
static level marked on tank during step 8
mark static level to achieve
If the dynamic fluid level is greater than 150 mm above the text marking, then place a mark below the static level marked on the tank of between equal to this distance and this distance plus 150 mm
MINIMUM FLUID LEVEL WITH PUMP OPERATING
If the dynamic fluid level is below the text marking, then place a mark equal to this distance above the static level marked on the tank
mark 'X mm' above static mark
'X mm' below text marking

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18. Add water to top up the level of the closed circuit fluid in the heat exchanger if required.

    To add water to the closed circuit fluid:

    - If not already removed, disconnect the drain line and remove the spring clip from the solar circuit relief valve at the top of the solar storage tank and remove the valve (refer to step 6).

    Warning: The solar circuit may be under pressure. Take care when removing the solar circuit relief valve, as a sudden discharge of pressurised hot vapour may be experienced. This discharge will create a sharp sound of vapour being released.

    - Place a funnel in the relief valve fitting.
    - Add water slowly through the funnel until the level of fluid in the hose is at the desired level as marked on the solar storage tank.

      Note: It may be necessary to undo the compression nut on the solar hot pipe at the top of the solar storage tank and loosen the pipe work from the fitting to assist the flow of water into the closed circuit through the funnel.

    - Remove the funnel from the relief valve fitting.
    - Position the solar hot pipe correctly in its fitting and tighten the compression nut if this has been loosened.

19. Drain closed circuit fluid from the heat exchanger if required.

    To drain closed circuit fluid:

    - If not already removed, disconnect the drain line and remove the spring clip from the solar circuit relief valve at the top of the solar storage tank and remove the valve refer to step 6).

    Warning: The solar circuit may be under pressure. Take care when removing the solar circuit relief valve, as a sudden discharge of pressurised hot vapour may be experienced. This discharge will create a sharp sound of vapour being released.

    - Place the end of the solar fluid hose into a graduated volumetric container and drain closed circuit fluid until the level of fluid in the hose is at the desired level as marked on the solar storage tank.

      It may be necessary to drain off the closed circuit fluid in small amounts, raising the hose back to the top of the solar storage tank and noting the level of the closed circuit fluid in the clear hose each time, so as not to drain below the desired level.

      Note: The closed circuit fluid contains food grade additives (rust inhibitor, anti-freeze agent, colour) and is harmless to the environment. However, it is good practice to recover any excess fluid and remove from site for appropriate disposal.

    - Re-affix the hose to the same location on the side of the solar storage tank.

20. If water has been added to or closed circuit fluid has been drained from the heat exchanger, recommence this procedure from step 10.

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Pressure Testing the Solar Circuit

21. Close the heat exchanger drain valve.
22. Refit the solar circuit relief valve, orientating the valve outlet to the rear of the solar storage tank. Secure with the spring clip. Reconnect the drain pipe to the valve.
23. Switch on the electrical supply at the isolating switch to the solar storage tank.

Warning: Take care not to enter the area inside the solar storage tank behind the access covers whilst the power is on as the electrical circuit will be live.

The red LED on the solar monitor label will start flashing.

The pump will activate and commence pumping fluid around the solar circuit.

Note: The level of the closed circuit fluid in the clear hose will not change, as the heat exchanger drain valve has been closed.

Allow the pump to operate for three (3) minutes (one and two collector systems) or for five (5) minutes (3 collector system) to allow the solar circuit to stabilise and fill with closed circuit fluid.

Note: The solar pump will operate for one hour with the hot sensor lead disconnected, before automatically turning itself off. Refer to step 25.

24. Check the solar pipe work and collector unions for leaks whilst the pump is operating and the solar circuit is at its working pressure. It is important to check all of the solar circuit pipe work, including in the roof space and on the roof.
25. If the procedure to check the solar pipe work for leaks is not complete before the pump has automatically turned off, then:
    - Switch off the electrical supply at the isolating switch to the solar storage tank.
    - Wait one (1) minute for the operating system to reset to its commissioning sequence, otherwise the pump may not operate when the power supply is switched on.
    - Recommence this procedure from step 23.
26. Switch off the electrical supply at the isolating switch to the solar storage tank.

    The red LED on the solar monitor label will stop flashing.

    The pump will deactivate.

    The closed circuit fluid will drain back down to the heat exchanger.
27. Rectify any leaks in the solar pipe work and collector unions.

    If brazing is required to fix any leaks, then it is necessary to remove the solar circuit relief valve (refer to step 6).

Warning: The solar circuit may be under pressure. Take care when removing the solar circuit relief valve, as a sudden discharge of pressurised hot vapour may be experienced. This discharge will create a sharp sound of vapour being released.

28. If minor leaks have been rectified, recommence this procedure from step 23. If a major leak has been rectified, recommence this procedure from step 6.

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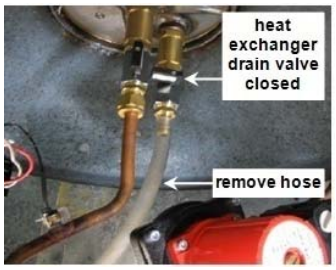
Remove Closed Circuit Fluid Level Hose

29. Remove the clear hose from the solar storage tank when satisfied the commissioning procedure is complete. To remove the hose:

    - Ensure the heat exchanger drain valve is closed.



    - Remove the hose from the side of the storage tank and place the end into a container to collect the closed circuit fluid remaining in the hose.
    - Replace the plug into the free end of the hose and lay the hose flat on the ground.
    - Loosen the hose clamp, if fitted, and carefully remove the hose and hose clamp from the heat exchanger drain valve fitting, ensuring there is no spillage of the closed circuit fluid.

      Clean up any spillage of closed circuit fluid.

    - Place the open end of the hose into the container and recover the remainder of the closed circuit fluid from the hose.

      Note: The closed circuit fluid contains food grade additives (rust inhibitor, anti-freeze agent, colour) and is harmless to the environment. However, it is good practice to recover any excess closed circuit fluid and remove from site for appropriate disposal.

Completing the Commissioning of the Solar Circuit

30. Reconnect the hot sensor lead to the connecting plug located on the tab in the upper front cover opening.

    It is important to reconnect the hot sensor lead, otherwise when the electrical supply is switched on, the solar pump will deactivate after one hour and the solar control unit will then enter a fault mode, will not operate and no solar gain will be achieved.

31. Replace the pump access and upper electrical covers of the solar storage tank.

    - If the ribbon cable from the solar monitor has been disconnected, reconnect it to the solar control module prior to replacing the pump access cover.

      Note: Care should be taken when reconnecting the ribbon cable to the solar control module to ensure the side of the connecting plug with the yellow label is **facing toward** the pump access opening. The connecting plug is non polarised and if it is connected with the side of the connecting plug with the yellow label facing away from the pump access opening, the functions of the green and red LEDs will be reversed. This will result in the red LED flashing instead of the green LED at solar pump start up.

32. Clean off the marks made on the side of the solar storage tank.
33. Remove the covers from the solar collectors.
34. Switch on the electrical supply at the isolating switch to the solar storage tank.

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Solahart Streamline, Synergy, Gas Booster Solar Water Heater Warranty

Warranty conditions

1. This warranty is applicable only to water heaters manufactured from 1st July 2006.
2. The water heater must be installed in accordance with the Solahart water heater installation instructions, supplied with the water heater, and in accordance with all relevant statutory and local requirements of the State in which the water heater is installed.
3. Where a failed component or water heater is replaced under warranty, the balance of the original warranty period will remain effective. The replaced part or water heater does not carry a new warranty.
4. Where the water heater is installed outside the boundaries of a metropolitan area as defined by Solahart or further than 30 km from a regional Solahart Dealer from whom the water heater was purchased, the cost of transport, insurance and travelling costs between the nearest Solahart Dealers premises and the installed site shall be the owner's responsibility.
5. Where the water heater is installed in a position that does not allow safe, ready access, the cost of accessing the site safely, including the cost of additional materials handling and / or safety equipment, shall be the owner's responsibility.
6. The warranty only applies to the water heater and original or genuine (company) component replacement parts and therefore does not cover any plumbing or electrical parts supplied by the installer and not an integral part of the water heater, e.g. pressure limiting valve; isolation valves; non-return valves; electrical switches; pumps or fuse.
7. The water heater must be sized to supply the hot water demand in accordance with the guidelines in the Solahart water heater literature.

Warranty Exclusions

1. REPAIR AND REPLACEMENT WORK WILL BE CARRIED OUT AS SET OUT IN THE SOLAHART WATER HEATER WARRANTY, HOWEVER THE FOLLOWING EXCLUSIONS MAY CAUSE THE WATER HEATER WARRANTY TO BECOME VOID AND MAY INCUR A SERVICE CHARGE AND / OR COST OF PARTS.

a) Accidental damage to the water heater or any component, including: Acts of God; failure due to misuse; incorrect installation; attempts to repair the water heater other than by the Solahart Dealer.

b) Where it is found there is nothing wrong with the water heater; where the complaint is related to excessive discharge from the temperature and / or pressure relief valve due to high water pressure; where the complaint is related to insufficient or incorrect fall in the pipe work preventing complete drain back of the closed circuit fluid of a Streamline closed circuit system; where there is no flow of hot water due to faulty plumbing; where water leaks are related to plumbing and not the water heater or water heater components; where there is a failure of gas, electricity or water supplies; where the supply of gas, electricity or water does not comply with relevant codes or acts.

c) Where the water heater or water heater component has failed directly or indirectly as a result of: excessive water pressure; excessive temperature and / or thermal input; blocked overflow / vent drain; corrosive atmosphere; non Solahart approved or incorrectly mixed closed circuit fluid being used; incorrect or insufficient filling of the closed circuit system with the closed circuit fluid; ice formation in the pipe work to or from the water heater.

d) Where the solar water heater or solar water heater component has failed directly or indirectly as a result of ice formation in the water ways of a Streamline open circuit system; a Streamline closed circuit system where the system has not been installed in accordance with the water heater installation instructions; a Streamline closed circuit system due to non Solahart approved or incorrectly mixed closed circuit fluid being used; a Streamline closed circuit system where there is insufficient or incorrect fall in the pipe work preventing complete drain back of the closed circuit fluid.

e) Where the electronic instantaneous gas booster water heater or electronic instantaneous gas booster water heater component has failed directly or indirectly as a result of ice formation in the water ways of a water heater: where the water heater has not been installed in accordance with the water heater installation instructions; where the electricity has been switched off or has failed and the water heater has not been drained in accordance with the instructions; due to an ambient temperature below -20°C (including wind chill factor).

f) Where the water heater is located in a position that does not comply with the Solahart water heater installation instructions or relevant statutory requirements, causing the need for major dismantling or removal of cupboards, doors or walls, or use of special equipment to bring the water heater to floor or ground level or to a serviceable position.

g) Repair and / or replacement of the water heater due to scale formation in the waterways or the effects of either corrosive water or water with a high chloride or low pH level when the water heater has been connected to a scaling or corrosive water supply or a water supply with a high chloride or low pH level as outlined in the Owner's Guide and Installation Instructions booklet.

h) Breakage of collector glass for any reason including hail damage. (We suggest that the collector glass be covered by your home insurance policy).

2. SUBJECT TO ANY STATUTORY PROVISIONS TO THE CONTRARY, THIS WARRANTY EXCLUDES ANY AND ALL CLAIMS FOR DAMAGE TO FURNITURE, CARPETS, WALLS, FOUNDATIONS OR ANY OTHER CONSEQUENTIAL LOSS EITHER DIRECTLY OR INDIRECTLY DUE TO LEAKAGE FROM THE WATER HEATER, OR DUE TO LEAKAGE FROM FITTINGS AND / OR PIPE WORK OF METAL, PLASTIC OR OTHER MATERIALS CAUSED BY WATER TEMPERATURE, WORKMANSHIP OR OTHER MODES OF FAILURE.

In addition to this warranty, the Trade Practices Act 1974 and similar laws in each state and territory provide the owner under certain circumstances with certain minimum statutory rights in relation to your Solahart water heater. This warranty must be read subject to that legislation and nothing in this warranty has the effect of excluding, restricting those rights.

NOTE: Every care has been taken to ensure accuracy in preparation of this publication. No liability can be accepted for any consequences which may arise as a result of its application.

Solahart Industries Pty Ltd ABN 45 064 945 848

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Document Revision History

Title: Streamline Closed Circuit Service Instructions	Document No: TM024-001

Revision	Details of change	D.O.I.
A	Service Manual Issued for Solahart Streamline Closed Circuit	12/07

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